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THE AMERICAN
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FEBRUARY, 1919

EDITORIAL.

PHARMACEUTICAL RESEARCH.

The discussions now being carried on in various circles as to the necessity for endowed pharmaceutic research, exhibit a rather belated awakening of our people to the importance of pharmacy to mankind. It is but a tardy realization of the absolute necessity for a more thorough knowledge of the medicines supplied in the manifold services rendered by pharmacists.

The need for knowledge of remedial agents is not new. It has existed from the very entrance of sin in the world and the consequent ailments of mind and body. The information pertaining to drugs now at our command, is quite extensive and, if the sum of human knowledge was to be gauged by the volumes that have been published on this branch, it would be a veritable mountain. This accumulation is the result of the studies and researches of many generations. Piecemeal has been the construction of this monument commemorating alike the labors of the Galenists, the Paracelsians, the newer disciples of synthetic "coal-tar medication" and the advocates of biologic therapy.

The savants of all times and of all nations have added their investigations and discoveries. The followers of Hippocrates, the studious monks and the delving alchemists in their early endeavors pried from nature many secrets that are daily applied in medicine and pharmacy. The modern development of medicine, surgery and chemistry and the studies in bacteriology with the aid of research laboratories with ample equipment, have further evolved truths of inestimable value.

The student of the history of pharmacy is aware of the fact that pharmacists have contributed no small share of the volume of

scientific investigation and discoveries. In a measure it is their own fault, that the world at large is not better acquainted with the achievements that should rightly be accredited to pharmacy. The classic investigation of Liebig on the organic compounds of cyanogen and the accompanying isolation of the glucoside amygdalin and the ferment emulsin and the determination that the reaction between these was the source of benzaldehyde in oil of bitter almonds, is regarded as one of the most noteworthy contributions of this great scientist. Is it unfair to surmise that this problem was suggested to him during his early experience as an assistant to an apothecary?

From the pharmacists of every civilized country have emanated many contributions detailing able researches. These have come from many sources including the laboratories of the schools of pharmacy, those of the manufacturers and the dispensaries of individual druggists. The literature of pharmacy includes many such contributions that are of inestimable value in the practice of this time. There is no lack of evidence that scientific pharmacy has kept abreast of scientific medicine and chemistry and further that American pharmacists have contributed a fair share to this progress, although at times the investigations have been carried on under very adverse circumstances and without the aid of an endowment such as has amply provided for medical research.

In the past, the tendency among the more favored endowed research branches, such as medicine and chemistry, has been to ignore the claims of pharmacy for a distinct recognition as a proper field for systematic researches and to seek endowments that would permit of the study and development of this branch of modern medical service. The writer recalls his efforts when president of the American Pharmaceutical Association, to interest certain endowments in the coöperative work that pharmacy could perform and would perform in scientific investigations for the betterment of mankind, if the opportunity was afforded either for an independent endowment or for a share in the funds assigned for medical investigation. The claim then made that the medical endowment was in a position to take up independently any phase of pharmaceutical investigation was not then justified by the facts and has not since been demonstrated.

The work of the pharmacist and the service he renders to mankind is distinctly different from that of the physician, surgeon or chemist. It is true that with these, as well as with some other

professional workers, there are certain lines of common interest because of the multiplex articles that the pharmacist is compelled to handle and the various duties that he performs. Necessarily their studies of certain of the sciences is a common ground for coöperation and the coördinating of their efforts in behalf of scientific progress.

Modern differentiation and classification of the branches of medicine, however, assigns to pharmacy a distinct field of work, which while coördinating with medical practice and the work of the chemist in other fields, leaves to him the investigation of the collecting drugs, their study, preparation of medicines and modes of administration. The physician must know the actions of drugs in order to apply them intelligently in his practice, but to the pharmacist belongs the intimate knowledge of the drugs and the standardization and preparation of the medicines that will permit of their successful use by the physician. Each in his sphere performs important and necessary service to mankind and the professions that they represent are justified in seeking material aid in the efforts to perfect their knowledge and service to their fellow man.

The field of investigation and research open to pharmacists in the study of the numerous substances used for medication and the processes for the preparation of medicines and their exhibition is unlimited. Despite all of the accumulated information, many of our drugs, even some of those most extensively used, are as yet but imperfectly studied. Pharmacognosy, chemistry, testing, standardization, purification, manipulation, dispensing are some of the avenues opening up an inexhaustible field for research. The source of many of the commercial varieties of drugs is still unknown and the chemistry of some of the most important is still very largely an undisclosed secret of nature. Many of the statements, even those in our pharmacopœias and accepted text-book authorities are badly in need of investigation and verification. The problems awaiting systematic, scientific investigation, that can very properly be considered as exclusively within the province of pharmacy, are numberless.

It is encouraging to note that at least certain phases of pharmaceutical research have appealed to the large chemical interests. It has been proposed that there should be created through the efforts of the American Chemical Society a research institute with an endowment of several millions of dollars for the purpose of "co-

öperative study of the chemistry and pharmacology of synthetic organic chemicals, designed for medical use." Such an institute would very likely copy the methods used so successfully by the German manufacturers of synthetics for the determining of the actions and medical uses and likewise the commercializing of many of their chemical productions. No matter what are the interests back of this proposed research endowment, it should be encouraged to proceed along the lines stated. Possibly a means may be found by which pharmacists engaged in research may coöperate with this scheme of "coöperative study" and certainly such coöperation is to be desired for the benefit of all the interests concerned.

This movement of the American Chemical Society, recognizes the importance of investigation and research studies as applied to but one group of medicinal products and but a narrow branch of the large subject of pharmaceutical research. For this one section of the broader general research that should be covered by pharmacy, it is surmised that an endowment of millions of dollars is essential. This action serves to accentuate the necessity for a crystallization of the sentiment in favor of an endowed institution for pharmaceutical research that shall not be limited to only one phase of the possibility, but shall cover the entire field of necessity for comprehensive research within the limitations that should very rightly be assigned to pharmacy.

At the meeting of the American Pharmaceutical Association in Indianapolis in 1916, the proposition to inaugurate "An American Pharmaceutical Research Fund" was discussed with the thought that there was a possibility of uniting the various interests that might be concerned in such a movement in a combined effort that would yield ample endowment for the researches in the field of pharmacy that are so essential to the public welfare and to the progress of science. The result was the establishment of the American Pharmaceutical Association Research Fund with a committee of the association appointed to supervise the work. Doubtless this committee will do everything that is within its power and the limited funds at its command to stimulate research work in pharmacy and we may expect results from their efforts. But has not the association by its limited view of the possibilities limited and curtailed in advance the results that are possible.

May our preachments for a broader view among pharmacists themselves be not in vain.

G. M. B.

OUR BOYS ARE COMING BACK.

Now that our boys in the khaki uniforms have performed their work over there so expeditiously and so effectively that "it's over, over there," new problems confront them and likewise those, who from necessity, were compelled to "keep the home-fires burning." With smiles we drowned the yearnings of the hearts as we cheered them on to the victory. Cheerfully we assumed the added labors due to a diminished force and labored and saved and gave for the triumph of our cause.

Now that peace is in sight and our boys are coming back we prepare to take up the new problems of reconstruction. It is the nation's duty to find employment, to reëstablish the returning soldiers and sailors in useful vocations. The sooner we engage in intensive cultivation of our soil, the sooner the busy buzz of the factory and shop, the sooner full energy of commerce and industry and of education be reëstablished the sooner the happiness of our people will be assured and the greater will be the prosperity of our country.

Our special interest is, of course, to aid the drug trade in the problems affecting this branch of vocational service. That the druggists of the country have been greatly inconvenienced by the lack of sufficient assistants and that many of the pharmacists and assistants to pharmacists by reason of their military service will be out of employment in their usual vocation is too well known to require any further comment. Many of these student assistants were not permitted to complete their educational requirements for registration as licensed practitioners of pharmacy. The prompt getting together of the employer with those seeking locations and the providing the means for the completion of the education of those whose course was interrupted so that they may become properly accredited pharmacists in their several states, are immediate problems of the period of reconstruction calling for our action.

Very properly the American Pharmaceutical Association has taken up this work and through the Advisory Committee of the A. Ph. A. for Soldier and Sailor Pharmacists is trying to solve many of the questions that will necessarily arise and here the American Pharmaceutical Association is again performing a signal service for the nation as well as for pharmacy. We bespeak the earnest coöperation of all bodies pharmaceutic as well as the support of the indi-

vidual druggists in the work of this committee which is under the able chairmanship of Frank H. Fredericks, No. 1005 Mercantile Library Building, Cincinnati, Ohio. If you are in a position to assist the committee in their work, in any way whatever, do not fail to communicate with the chairman.

The Philadelphia College of Pharmacy has likewise appointed a committee with Prof. Freeman P. Stroup as chairman to consider not only the question of the reëstablishment of its own graduates who have been in the military service, but likewise to coöperate with the Committee of the A. Ph. A. and any other organizations or movements having as the object in view the assisting of soldiers and sailors to secure employement in the drug trade or allied industries.

G. M. B.

HYOSCYAMUS NIGER.

By George P. Koch, Ph.D.

Introduction.

Due to the fact that many crude drugs cannot be secured from foreign countries at the present time, the cultivation of medicinal plants in the United States has been greatly stimulated. In as much as the methods of propagation of the various medicinal plants are still quite imperfect, much research is still necessary in order that such crops may be grown successfully. Several investigators have worked on various phases of the medicinal plant culture, but as yet there seems to be an insufficient amount of data available by which a more or less inexperienced individual can go ahead and be successful in the production of such a crop. A very important factor in growing medicinal plants in the United States, where the cost of labor is so great, is the application of methods whereby such crops can be grown on a comparatively large scale, thus bringing into play the use of labor saving implements as much as possible (4).

The production of a crop running as high as possible in alkaloids and securing this crop as cheaply as possible, determines the extent to which such procedures would be successful. In commercial culture, *Hyoscyamus niger* seems to be a plant with which the greatest amount of difficulty has been experienced, and as yet, is grown very little in this country. Stockberger (10) contends that

"With very few exceptions, recent attempts to cultivate henbane as a drug crop in his country have resulted in failure." With the above thoughts in mind the author has made rather detailed study covering most of the phases of growing and developing hyoscyamus, belladonna and digitalis. The results considered in this paper refer only to the work with hyoscyamus. The results of the investigation with belladonna and digitalis will be presented in another series of papers (5, 6).

Germination of Seeds of *Hyoscyamus niger.*

The variability of seeds is always a very important factor. The only satisfactory method of determining viability is by germination tests. How long a time does it require for the seeds of *Hyoscyamus niger* to germinate? Newcomb (7) states that the seeds of the biennial variety of *Hyoscyamus niger* germinate in about four to six weeks, while the seeds of the annual variety germinate in from eight to ten days.

To secure more information on the germination of the seeds of *Hyoscyamus niger,* two samples of seed of the annual variety were tested. The blotter method, which is usually employed for testing seeds, was used. Two one hundred seed lots of each sample were counted out and the extent of germination noted. The results as tabulated below are the average of two determinations.

TABLE I.

Showing Percentage of Germination of Seeds of *Hyoscyamus niger* on Various Days.

Sample No.	Number of Days After Seeds were Planted											
	4	5	6	7	8	9	11	12	15	18	21	23
9	6	11	27	48	66	71	71	73	73	73	73	73
10	22	24	40	77	93	93	94	95	95	95	95	95

Upon observing the results as presented in the above table, it will be seen that most of the viable seeds will have germinated in from nine to eleven days.

Determining the viability of *Hyoscyamus niger* seeds between blotters or filter paper is very satisfactory but is limited, and the practice of germinating seed in the soil in conjunction with the blotter method, seemed quite advisable.

All soils contain a large number of weed seeds, some of which germinate very quickly, and thus interfere with germination tests. The soils also contain an abundance of spores of various destructive organisms, in particular, the "damping off" fungi. Sterilizing the soil by heat under pressure is the most satisfactory method of destroying these destructive agencies.

It had been previously shown in germination experiments with belladonna seeds (5) that by increasing the humidity and preventing excessive evaporation, the percentage of germination was very much larger than where these factors were not considered. With the above thoughts in mind, the following experiment was carried out. Into four flats, dimensions 12 by 20 inches, 25 per cent. compost soil was placed to within one inch of the top. A thin layer, about one fourth on an inch, of sand was sieved over the soil. The contents of the flats were saturated with water. Two of these flats were carefully wrapped with heavy manila paper and then sterilized in the autoclave at 15 pounds pressure for three hours. After this treatment, one flat was planted with one thousand hyoscyamus seeds of sample no. 9, and the other, with one thousand seeds of sample no. 10. Likewise, the two unsterile flats were planted with the same number of seeds of nos. 9 and 10, respectively. All the flats were covered with glass plates and placed in the greenhouse. The soil was kept moist by wetting slightly whenever necessary.

The number of seeds germinating during a period of three weeks was ascertained at intervals of one week. The germination of the samples of Hyoscyamus seeds in this experiment are recorded below.

TABLE II.

SHOWING THE PERCENTAGE OF GERMINATION OF SEEDS OF *Hyoscyamus* IN STERILE AND UNSTERILE SOIL IN FLATS.

Sample No.	Treatment.	Days After Seeds were Planted.		
		7	14	21
9	Unsterile	5.7	8.1	7.9*
9	Sterile	20.1	32.6	33.8
10	Unsterile	14.0	16.8	10.3*
10	Sterile	30.9	37.1	31.9

* Low results due to "damping off" fungi.

The results of the experiment as presented in the above table show that in the sterilized soil, the conditions were such that from

three to four times as many seeds germinated as where the soil was not sterilized. On comparing the results as shown in Table I with those in Table II, we find a great difference in the relative number of seeds germinated by the two methods. In the case of sample no. 9, 48 per cent. germinated by the blotter method while only 5.7 per cent. germinated in the unsterile soil, and 20.1 per cent. in the sterile soil. While in the case of sample no. 10, 77 per cent. germinated in seven days by the blotter method, and 14 and 30.9 per cent., respectively, germinated in the soil. It is true that when germination is determinated by the soil method, the sprouts must appear through the thin layer of sand that covers the seeds, hence, it would probably take a longer period of time to see the sprouts than when the seeds are tested between blotters or filter paper. The destructive effects produced by "damping off" fungi are very apparent in the unsterilized soil by noting the results of the germination of samples nos. 9 and 10 on the twenty-first day.

To hasten and increase the germination of seeds of various kinds, usually those with hard coats, treatments with sulphuric acid and freezing are sometimes recommended. Newcomb and Haynes (8) found that by treating the seeds of the biennial variety of *Hyoscyamus niger* with concentrated sulphuric acid proved beneficial to germination, in that the results were much more uniform. To determine to what extent physical and chemical treatments were effective in hastening and producing more uniform germination of hyoscyamus seed, an experiment entailing these particular factors was made. One sample of hyoscyamus seed was moistened and then frozen at —12° C. for four hours. Another sample was treated with concentrated sulphuric acid for 2½ minutes, the acid was quickly washed off, and the seed, about 5 Gm., was quickly washed with a liter of water. Flats of soil were sterilized as before. One flat was planted with one thousand of the original untreated seed; a second, with one thousand frozen seeds and a third, with a like number of the acid treated seeds. The flats were covered with glass plates and kept moist. After 21 days, the seedlings resulting from the germination of the seeds were counted. The results are presented below.

TABLE III.

SHOWING THE EFFECT OF VARIOUS TREATMENTS OF *Hyoscyamus* SEED ON THE PERCENTAGE OF GERMINATION.

Treatment	Percentage of Germination
Untreated seeds	2.4
Frozen seeds	4.0
Acid treated seeds	1.5

The results above show that freezing the seeds was effective in increasing the germination, while treating them with sulphuric acid produced no beneficial effects.

EFFECT OF INORGANIC FERTILIZERS UPON THE GROWTH AND DEVELOPMENT OF *Hyoscyamus niger.*

With such an expensive crop as hyoscyamus, it is quite essential that the correct fertilizing treatments are made. The extent to which fertilizers are effective in increasing the yield of hyoscyamus was determined.

The methods and fertilizer applications which were employed in the experiment follow. The soil used was that of a clay loam, which was the result of the disintegration of mica schist rock formation. This soil was taken from the upper five inches, namely, the surface soil, from the premises of the Mulford Biological Laboratories, at Glenolden. Four hundred and fifty grams of this soil was weighed and placed in each of eighteen 4-inch pots. The amounts of fertilizers applied were as follows: calcium carbonate 1,000 lbs.; calcium acid phosphate 800 lbs.; potassium sulphate 400 lbs.; sodium nitrate 600 lbs.; and magnesium sulphate 100 lbs., per acre of 2,000,000 lbs. Each determination was made in triplicate. The moisture conditions were maintained at the physical optimum of the soil, each pot being carefully weighed every morning and the loss of moisture restored with distilled water. Each pot was planted May 15, 1918, with a small plant, approximately 3½ to 4 inches high. Plants of as nearly the same size as possible were planted in the various pots, thus preventing every possible source of error. The plants, most of which were blooming, were harvested on August 12, 1918. The stems of the plants were cut off near the surface of the ground. The leaves and stems of each plant were placed in manila bags and dried at 90 degrees C. The results of the effects of the fertilizers upon the growth of hyoscyamus are shown below:

TABLE IV.

EFFECT OF VARIOUS FERTILIZERS UPON THE GROWTH OF *Hyoscyamus niger.*

Pot No.	Fertilizer Treatment	Wt. of Dry Material in Gms.	Average Wt. in Gms.
801	No fertilizer	1.6	
802	"	1.7	
803	"	1.7	1.66
804	Complete fertilizer*	2.1	
805	"	2.3	
806	"	4.2	2.80
807	Complete—$Ca(H_2PO_4)_22H_2O$	1.9	
808	"	0.9	
809	"	0.5	1.10
810	Complete—K_2SO_4	2.2	
811	"	3.1	
812	"	2.2	2.50
813	Complete—$NaNo_3$	2.1	
814	"	2.3	
815	"	1.7	2.00
816	Complete—$CaCo_3$	2.7	
817	"	1.2	
818	"	2.3	2.20

* Complete fertilizer represents 1,000 lbs. $CaCO_3$, 800 lbs. $Ca(H_2PO_4)_22H_2O$, 400 lbs. K_2SO_4, 600 lbs. $NaNO_3$, and 100 lbs. $MgSO_4$ per acre.

Applying a complete fertilizer to this soil greatly increased the yield of *Hyoscyamus niger,* as seen in comparing the weights of plants of pots nos. 804, 805 and 806 with 801, 802 and 803. Calcium phosphate seems to be the most necessary fertilizer required for the maximum growth of this plant as seen in determinations 807, 808 and 809. With this soil K_2SO_4 seemed to be the least necessary for the maximum growth of the plant. Likewise, the absence of calcium carbonate did not result in materially reducing the yield of *Hyoscyamus niger* than where it was supplied.

CONTROL OF INSECTS.

In the cultivation of *Hyoscyamus niger,* the principal factor to be considered is the control against the attack of chewing insects. Stockberger (9) summarizes as follows: "the leaves of henbane usually suffer severely from the attack of the potato beetle, especially during the first year, and the crop is very likely to be destroyed if grown within range of this insect." Newcomb and Haynes (8) state that hyoscyamus is very susceptible to the attack of the Colorado potato beetle, but conclude that these may readily be controlled by early application of Paris green or other arsenical

poisons. Similarly, Borneman (1) stated that these plants should be sprayed about every day, as the potato bugs would devour them in one day. Farwell (3) concluded that the lack of success in commercial culture of hyoscyamus is the large cost in keeping the plant free from bugs.

Since it was difficult to keep *Hyoscyamus niger* free from chewing insects, a series of experiments were made to ascertain what spray mixtures could be employed that would keep the insects off the plants, and still not be injurious to the plant tissues. As a preliminary experiment, 15 large *Hyoscyamus niger* plants were selected. These, as yet, had not been attacked by any insects. Three plants were sprayed with arsenate of lead (5 lbs. 100 gal.); three, with Paris green (1 lb. 100 gal.); three were dusted with flowers of sulphur, and six were kept as controls, or untreated. The plants were sprayed on May 22, 31, and again on June 6, and the effects of the insects was carefully watched. The results are presented in the following table:

TABLE V.

SHOWING THE CONTROL OF THE PLANTS OF *Hyoscyamus niger* AGAINST THE ATTACK OF INSECTS.

Plants No.	Treatment.	Results.
1	No treatment.	Almost entirely destroyed.
2	" "	Entirely destroyed.
3	" "	Entirely destroyed.
4	Arsenate of lead.	Plants fine, few small holes in leaves.
5	" " "	Plants fine, few small holes in leaves.
6	" " "	Plants fine, few small holes in leaves.
7	Paris green.	Plants destroyed by spray.
8	" "	Plants destroyed by spray.
9	" "	Plants destroyed by spray.
10	Sulphur	Little injury, lower leaves destroyed.
11	"	Little injury, lower leaves destroyed.
12	"	Little injury, lower leaves destroyed.
13	No treatment.	Almost entirely destroyed.
14	" "	Almost entirely destroyed.
15	" "	Entirely destroyed.

From the foregoing results, it is very apparent that hyoscyamus plants must be sprayed in order to control insects, as in every case the control plants were either partially or entirely destroyed. Arsenate of lead was very effective in controlling the insects, and

TABLE VI.

SHOWING THE EXTENT TO WHICH VARIOUS SPRAYS CONTROLLED LEAVES OF *Hyoscyamus niger* AGAINST THE ATTACK OF THE COLORADO POTATO BEETLE.

Plant No.	Spray Treatment	Presence of Beetles	Results After 24 Hours		Results After 70 Hours	
			Condition of Beetles	Condition of Leaves	Condition of Beetles	Condition of Leaves
1	No treatment.	No beetles.	———	No injury.	———	No injury.
2	" "	Beetles added.	Very active.	Leaves entirely eaten.	Very active.	As noted before.
3	" "	" "	" "	" " "	" "	" " "
4	Arsenate of lead.	No beetles.	———	No injury.	———	No injury.
5	" " "	Beetles added.	Dead.	Two small holes in leaves.	Dead.	As noted before.
6	" " "	" "	"	About 1/10 leaf destroyed.	"	" " "
7	Paris green (1–150).	No beetles.	———	No injury.	———	No injury.
8	" " "	Beetles added.	1 dead.	About 1/7 leaf destroyed.	Dead.	1/6 of leaf surface eaten.
9	" " "	" "	Dead.	" 1/6 " "	"	Same as before.
10	Paris green (1–300).	No beetles.	———	No injury.	———	No injury.
11	" " "	Beetles added.	1 dead.	1/4 of leaf surface eaten.	Dead.	Same as before.
12	" " "	" "	1 "	1/6 " " " "	1 dead.	" " "
13	Sulphur.	No beetles.	———	No injury.	———	No injury.
14	"	Beetles added.	Very active.	1/4 of leaf surface eaten.	Very active.	3/4 of leaves eaten.
15	"	" "	" "	1/4 " " " "	" "	3/4 " " "

at the same time, was not injurious to the plant. Paris green (1–100) was too concentrated for hyoscyamus, as six days after it had been applied, all three plants were dead, as the result of injury from spraying. Up to a certain period, flowers of sulphur proved fairly effective in controlling the insects. After that time, they became accustomed to the sulphur, and hence, it did not combat the insects. The Colorado potato beetle was the most destructive insect.

To gain more information on the effect of the various sprays in controlling the Colorado beetle, another series of experiments was carried out under controlled conditions. To each of eighteen sterile petri dishes, either one large or two medium sized portions of leaves of hyoscyamus were added. The leaves of three petri dishes received no spray treatment. The leaves of three dishes were sprayed with arsenate of lead (5 lbs. per 100 gal. of water); three, with Paris green (1 lb. per 150 gal. of water); three, with Paris green (1 lb. to 300 gal. of water); and three, with flowers of sulphur. Into two petri dishes of each series of three, two potato beetles (one large and one of medium size) were placed. After 24 hours and again after 70 hours, the petri dishes and their contents were carefully examined and the results recorded.

As demonstrated in the preceding table, arsenate of lead was the most satisfactory in controlling the potato beetles, as it required but a small amount of this poison to destroy these insects. Both dilutions of the Paris green were effective, but it required a longer period of time to destroy the beetles, and a considerably larger amount of the leaves were destroyed where the Paris green was applied, than where the arsenate of lead was employed. Flowers of sulphur was entirely unsatisfactory, as a means of controlling the beetles, as shown on the second examination (70 hours after the insects had been in contact with the leaves), the beetles had almost entirely destroyed the hyoscyamus leaves, and the bugs were still very active. The rapidity with which the beetles destroy the leaves is appreciated in the results as shown in plates no. 2 and no. 3. In these cases where the leaves were not sprayed, the entire leaves were destroyed in 24 hours.

To ascertain how long Colorado potato beetles could remain alive when given no food, six beetles (two large, two of medium size and two small) were placed in a sterile petri dish, and their activity was noted. The result is shown in table below:

TABLE VII.

SHOWING THE ACTIVITY OF SIX COLORADO POTATO BEETLES WHICH WERE ALLOWED TO REMAIN IN A PETRI DISH AND RECEIVING NO FOOD.

Kind of Beetles	Activity 24 Hours	Activity 70 Hours	Activity 77 Hours	93 Hours	100 Hours	167 Hours	223 Hours	238 Hours
Two small	Very active	Both ½ original size	Both alive	Both dead *				
Two medium	" "	" " " "	" "	One "	One alive	Both dead		
Two large	" "	" " " "	" "	Both alive	Getting smaller	" alive	1 dead	Both dead

* Both beetles eaten up by the others, as only the heads remained.

The above experiment shows conclusively that the potato beetles can live for a long period of time without receiving any food. Their size diminishes gradually during their period of fasting, and they decrease to less than one third of their original size before they die. It shows that the larger beetles can withstand the lack of food much better than the smaller ones. It also demonsrates the fact that potato beetles will utilize their own kind as a source of food when necessity demands it.

Seed Formation.

Since it was found very difficult to secure seeds of *Hyoscyamus niger* from the various possible sources, the extent of seed formation and selection were studied. To determine the effect of the stage of maturity of the seeds upon their variability, seeds were collected from plants at various periods. After they were dry, germination tests were made by the blotter method as mentioned above. Four samples were considered in this experiment. Sample no. 1 was collected on June 21, 1918, and sample no. 2, on June 25, 1918. The plants from which these seeds were taken were large and branching. The leaves and seed pods were still green. Some of the seeds in the pods were white in color, but most of them were beginning to turn brown. Samples nos. 9 and 10 were collected on July 24 and 25, respectively. These seeds were taken when the leaves and seed pods were quite dry and the seeds were dark brown and hard in consistency. The relative viability of these four samples of seed are shown in the table below.

TABLE VIII.

Showing the Relative Viability of Seeds of *Hyoscyamus niger* Collected at Various Stages of Maturity.

Sample No.	Date of Collection	Percentage of Germination	
		9 Days	18 Days
1	June 21	1.0*	4.0
2	June 25	3.0	6.0
9	July 24	68.0	73.0
10	July 25	93.0	95.0

* These results are the average of two determinations.

The results presented in Table VIII are very conclusive and show that, in order to secure viable seeds of *Hyoscyamus niger,* they

must be well matured before they are taken from the plant. Seed collected from green plants is practically worthless. The most desirable time to harvest the seeds is when the seed pods and leaves of the plants are becoming dry and the first seed pods are beginning to show signs of springing open.

The hyoscyamus plant, as most all of the members of the night shade family, is a very prolific seed producer. The number of seeds in the pods ranging from 200 to 350, and the number of pods on the larger plants may be as many as 250 to 270.

To determine approximately, the amount of seed that hyoscyamus plants would yield, the mature seed of thirteen representative plants was carefully collected and dried. The seeds of each plant were threshed out by hand and then weighed. The average yields of seed per plant for the thirteen plants under consideration was twenty-three grams.

The Alkaloid Content and the Utilization of the Various Parts of the *Hyoscyamus niger* Plant.

What parts of the plant of *Hyoscyamus niger* can be employed for commercial purposes and at what stage in the growth of the plant is it most desirable to harvest these parts? The U. S. P. requirement for hyoscyamus calls for "the dried leaves and flowering or fruiting tops of *Hyoscyamus niger* (Linné) yielding not less than 0.065 per cent. alkaloid of hyoscyamus." Newcomb and Haynes (8) show results of 0.140 per cent. alkaloid for the flowering tops of the annual variety of *Hyoscyamus niger,* while Carr's (2) work shows 0.12 per cent. of total alkaloid in the dried herb of the first year's growth of this plant. It is true the soil, fertilizer treatment, climate, time of collection and many other factors influence the total alkaloid content of *Hyoscyamus niger.* Since the lowest stated figure is 0.065 per cent. of alkaloid, it is very essential that this amount be contained in the product.

To ascertain the variation in alkaloid content of the leaves of hyoscyamus plants, three average-sized plants were studied. The leaves of these plants were still all green, most of the seed pods had already formed, and just a few small blossoms remained at the upper end of the stem. The leaves and seed pods were carefully taken from each plant and each placed in manila bags and dried. To find out the relation of the alkaloid content of the leaves to that of the

stems and roots, the stems and roots of these three plants were also carefully separated and dried at 60° C.

TABLE IX.

SHOWING THE ALKALOID CONTENT OF THE LEAVES, ROOTS AND STEMS OF *Hyoscyamus niger.*

Sample No.	Portion of Plant.	Percentage of Mydriatic Alkaloid.
1	Leaves and seed pods of plant No. 1	0.100
2	Leaves and seed pods of plant No. 2	0.102
3	Leaves and seed pods of plant No. 3	0.073
4	Roots and stems of plants Nos. 1, 2 and 3	0.081

The results as presented in this table show that there is quite a large margin of difference in the alkaloidal content of the leaves and seed pods of sample no. 3 and those of no. 1 and no. 2. But in every case, these figures are well above the U. S. P. requirement. It is interesting to note that the roots and the stems of these three plants taken together have a percentage of 0.081 of mydriatic alkaloid. This figure being a higher amount than the percentage of alkaloid of the leaves and seed pods of plant no. 3. Hence, from this result, we would be justified in utilizing the roots and stems of these plants in conjunction with the leaves.

It is a well established fact that, as the leaves of belladonna plants mature and dry, as the season advances, the percentage of alkaloid therein decreases. To secure more information on this point with regard to *Hyoscyamus niger,* three samples of leaves were collected from hyoscyamus plants, after the seed pods had been removed and the seeds harvested for planting. Similarly, to find the percentage of alkaloid in the dry stems and roots, a series of such samples were collected for analysis.

TABLE X.

SHOWING THE ALKALOID CONTENT OF DRY LEAVES AND STEMS AND ROOTS OF PLANTS OF *Hyoscyamus niger.*

Sample No.	Portion of Plant.	Percentage of Mydriatic Alkaloid.
1	Dry leaves taken from six plants	0.057
2	Dry leaves taken from four plants	0.065
3	Dry leaves taken from five plants	0.0619
4	Stems of six plants of sample No. 1	0.052
5	Stems and roots of four plants of sample No. 2	0.0375
6	Stems of five plants of sample No. 3	0.057
7	Roots of five plants of sample No. 3	0.130

On comparing the results as presented in tables nos. 9 and 10, it is apparent that as the leaves, stems and roots mature and become dry, the percentage of alkaloid in these parts is very much less than when these parts are green. While we cannot make an absolute comparison of the results in these two cases as the parts of different plants were employed in the second than in the first case, nevertheless, this difference is so marked that we are quite safe in making the above assertion. It seems quite remarkable that the alkaloid content of the leaves, which were collected after the seed pods had been harvested and the mature seed utilized as such, would be so great, as in no case was the alkaloid content much below the U. S. P. requirement. Upon studying the results of samples nos. 4, 5 and 6, it is seen that these are slightly lower than the results of the analysis of the corresponding leaves of samples nos. 1, 2 and 3, respectively. The sample of roots, no. 7, contained a very high percentage of alkaloids, which would indicate that the roots of hyoscyamus can be utilized even after the leaves and stems have matured and dried. Can the leaves, stems, and roots of *Hyoscyamus niger* be utilized for commercial drug purposes when they are dry (have lost all the green coloring matter), and after the seed has matured and has been harvested? If the total mydriatic alkaloid content is a criterian, we would say, that using the above figures as the basis of our information, that it would be impractical to use the dry and dead parts of these plants alone.

Summary.

From the data herein presented, we can summarize as follows:

1. If the seed of the annual variety of *Hyoscyamus niger* is viable, 90 per cent. of the viable seed will germinate in from 9 to 11 days.

2. Sterilizing the soil, when using this as a medium in which to test the viability of hyoscyamus seeds, increases the percentage of germination 250 to 400 per cent. above the germination produced in unsterile soil.

3. Freezing the moist seeds at — 12° C. for four hours, slightly increased the percentage of germination. Treating them with concentrated sulphuric acid did not increase the percentage of germination.

4. Applying a complete fertilizer of 1,000 lbs. of calcium car-

bonate, 800 lbs. of calcium phosphate, 400 lbs. of potassium sulphate, 600 lbs. of sodium nitrate, and 100 lbs. of magnesium sulphate per acre of 2,000,000 lbs., to a clay loam soil, increased the yield of *Hyoscyamus niger*. With this soil, calcium phosphate was the most necessary fertilizer required by this plant.

5. Arsenate of lead (5 lbs. to 100 gal. of water) applied to large plants proved the most effective in controlling the destructive insects, and was not injurious to the leaves. Paris green (1 lb. to 100) destroyed the leaves of these plants. Paris green in dilutions (1 lb. to 150 gal. and 1 lb. to 300 gal.) proved fairly effective in controlling the Colorado potato beetle, but were not as effective as arsenate of lead.

6. Hyoscyamus seed for planting should not be collected until the seed pods and leaves of the plant are dry. At this stage, the seeds will be dark brown and the seed coats of a hard consistence.

7. Plants of *Hyoscyamus niger* may easily produce 23 grams of seed.

8. The alkaloid content of green hyoscyamus leaves plus seed pods, collected when most of the seed pods had formed, varied in percentage of mydriatic alkaloids from 0.073 to 0.102. The roots plus the stems have a percentage of mydriatic alkaloids of 0.081.

9. Dry leaves of *Hyoscyamus niger,* collected after harvesting the mature seed, had an alkaloid content varying from 0.057 to 0.065 per cent. Hence, the alkaloid content of the leaves when taken from the plants, when mature and dry, is considerably less than those taken from the plants when green. The mydriatic alkaloid content of the stems of the dry plants collected after harvesting the mature seed, was from 0.052 to 0.057 per cent.

10. The stems of *Hyoscyamus niger* collected when the plants are green, can probably always be utilized in conjunction with the leaves and the total alkaloid requirement of the U. S. P. of 0.065 per cent., be met.

Acknowledgment is gratefully made of the valued assistance of Mr. J. R. Butler in the experimental work, and to Mr. George E'We and the analytical department for having made the alkaloid determinations.

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THE SO-CALLED COLD PROCESS FOR OFFICIAL SOAPS.

BY F. M. JORDAN,

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LINIMENTUM SAPONIS MOLLIS. TINCTURE OF GREEN SOAP.

The official process involves first the manufacture of the soap, which is later dissolved in alcohol and flavored with oil of lavender. The following cold process completes the preparation in one operation and yields a product which in every way meets the official requirements:

Cotton seed oil	279.50 Gm.
Potassium hydroxide	55.90 Gm.
Water	292.50 mils.
Oil of lavender	20.00 mils.
Alcohol a sufficient quantity to make	1,000.00 mils.

Dissolve the potassium hydroxide in 180 milliliters of water, and, while still hot, add the cotton seed oil. Add 180 milliliters of alcohol and stir or agitate the mixture until a clear liquid soap results, which should be in about ten minutes. Allow to stand for one hour, add sufficient alcohol to thoroughly liquefy, about 200 milliliters, and 112.50 milliliters of water. Now add the oil of lavender and sufficient alcohol to make the finished product measure 1,000 milliliters. Allow to stand one week and filter.

Assuming that the writer's figures are correct, each ten milliliters of this tincture contain exactly 6.50 Gm. of official green soap. It is now a simple matter to determine the degree of alkalinity using the method directed by the pharmacopœia for standardizing green soap. An excess of alkali must be avoided and the preparation of a test batch of, say 100 milliliters, is suggested. An assay of this test batch gives at once the correct proportion of alkali to oil and the same materials may then be used with confidence for batches of any size.

Linimentum Saponis. Soap Liniment.

The saponification of olive oil by the cold process is a very simple matter and this fact is perhaps the best argument for the suggested modification of the present official directions. Even a properly and honestly made castile soap, an article by the way which is just now somewhat of a rarity, is by no means easily dissolved in water. The following formula yields a product which in every way meets the official tests for soap liniment:

Olive oil	53 Gm.
Sodium hydroxide	7 Gm.
Camphor	45 Gm.
Oil of rosemary	10 mils.
Alcohol	700 mils.
Water a sufficient quantity to make	1,000 mils.

To the olive oil, contained in a suitable vessel, preferably of

glass, add a solution of the sodium hydroxide in 25 milliliters of water. To this mixture add 25 milliliters of alcohol and agitate the contents of the vessel until saponification is complete and the mass becomes clear, gelatinous and semi-solid. Let stand one hour or longer. Dissolve the camphor and oil of rosemary in 675 milliliters of alcohol, add to the soap just prepared, and, if necessary, add sufficient water to make the finished product measure 1,000 milliliters. Finally mix thoroughly.

LIQUOR CRESOLIS COMPOSITUS. COMPOUND SOLUTION OF CRESOL.

The official preparation is a fifty per cent. solution of cresol in a liquid consisting of soap, water and alcohol. The considerable excess of alkali seems unnecessary and the alcohol may be dispensed with as serving no useful purpose. The process below is offered as one in every way satisfactory both from a standpoint of economy in labor and materials and superiority of the finished product. This preparation forms brilliantly clear solutions with water in all proportions.

Cresol	500 Gm.
Sodium hydroxide	40 Gm.
Linseed oil	300 Gm.
Water a sufficient quantity to make	1,000 Gm.

To the sodium hydroxide, which must be of full strength, contained in a suitable tared vessel, add 150 milliliters of water and stir until solution has been effected. While still hot, in a thin stream and under constant stirring, add the linseed oil. Continue the stirring until the mass acquires the appearance and consistence of an emulsion and set aside, without further stirring, for twelve hours or over night. To the soap thus formed add the cresol and sufficient water to make the finished product weigh 1,000 grams and stir the mixture until complete solution has been effected, which may be hastened, if desired, by the application of gentle heat. Sodium hydroxide of less than full strength may be used provided its actual strength be taken into account.

THE HOSPITAL CORPS OF THE NAVY.

Naval Officers Tell the N. P. S. A. about the work of the Corps.

At a meeting of the National Pharmaceutical Service Association held in the Philadelphia College of Pharmacy on Friday evening, December 20, Lieutenant Commander George F. Cottle, Detail Officer of the Hospital Corps of the United States Navy, and Lieutenant W. T. Minnick, Commandant of the Hospital Corps unit, training at the Philadelphia College of Pharmacy, presented a comprehensive and interesting account of the work of the organization in the war.

In the absence of the president, Mr. George M. Beringer, Professor Charles H. LaWall, vice-president, presided. The president was authorized by motion, to publish as a part of the minutes of this meeting a résumé of the work of the Association during the past year and a half, and set forth the need of continued effort by the Association in the interest of recognition of professional pharmaceutical work by governmental authorities.

The facts presented by Lieutenant Commander Cottle and Lieutenant Minnick will prove of great interest to the pharmacists of the country, since they show the important place which pharmacy occupies today in the Navy, and the recognition which it has secured for itself through shear merit.

Up to 1898 the "apothecary" of the Navy was an appointee of the medical officer under whom he was to serve, being selected from the "baymen" or from civil life. The "baymen" were enlisted men detailed as nurses from other branches of the Naval service and frequently were those who had proven inefficient elsewhere. They were not selected because of special fitness or training for the work. When the services of the apothecary were no longer needed, he was discharged from the Naval service.

As the work of the Medical Corps increased, and more need was found for proper hospital facilities and medical aid, a permanent Hospital Corps was established by law. This was in 1898. The Corps consisted of hospital apprentices, hospital apprentices, first class, hospital stewards, and twenty-five pharmacists, with warrant rank.

No further change was made in the organization of the Corps until 1912, when the rank of "chief pharmacist" was established. This grade carried with it the rank, pay, and allowance of an ensign, which is that of the Annapolis graduate when first detailed to duty.

The services rendered by the Hospital Corps had been of such value as to justify the recommendation by the Surgeon General of the Navy for the advanced rank.

In 1916, in recognition of the efficiency shown by these pharmacists legislation was secured from Congress, authorizing the appointment of as many pharmacists as the needs of the service demanded, and in 1917, the Surgeon General further recognized the importance of the service, by recommending a temporary rank of Lieutenant (Junior grade), and Lieutenant, for 82 of the members of the Corps, and the appointment of 220 Pharmacists (temporary). The several ratings of the Corps are Hospital Apprentices, second and first class; Pharmacist's Mate, third, second and first class; Chief Pharmacist's Mate (acting appointment), Chief Pharmacist's Mate (permanent appointment); Pharmacist and Chief Pharmacist. For the period of the war, all Pharmacists and Chief Pharmacists were advanced first to Lieutenants (Junior grade) and later to Lieutenants, and a large number of Chief Pharmacist's Mates were given temporary appointments as Pharmacists.

The duties of the members of this Corps, especially those who hold the higher ratings, are greatly varied and call for many qualifications and extensive training.

Nursing.—Inasmuch as women nurses are not available for sea duty, this group of men are required to perform any nursing duties which the needs of the service may demand, such as the care of the sick, giving of baths, the care of the bed, and bed clothing, taking of temperature, pulse, and respiration, preparing of charts, the administration of enemas and hypodermics, the preparation of patients for the operating room and any of the various services, appertaining to nursing.

Operating Room.—In addition to the preparation of the patients for operations, these men are trained to take care of the surgical instruments, and equipment, to do all of the necessary sterilization, know the instruments, care for them and to make all preparation for operations. During the operation, they may serve as assistants to the surgeon, and usually administer the anesthetic. They may

also be called upon to prepare the injection and assist in administering arsphenamine (salvarsan).

Ward Management.—The Hospital Corpsmen become the responsible officials, for the establishment and management of the hospitals. They are responsible for the organization of the ward force, for the cleanliness and routine work of the ward, and also responsible for all records and property.

X-Ray Department.—A limited number of men have received special training as X-ray operators. This is becoming increasingly important and the complete specialized training must include the knowledge of apparatus and experience in the taking of X-ray pictures and X-ray examinations, and also the development of the plates and making of prints.

Recruiting.—In the recruiting stations of the Navy, the hospital corpsmen serve as assistants, making the preliminary physical examinations, preparing the necessary records and securing the identification data, including the making of finger print impressions.

Commissary.—Pharmacists are often responsible for the planning of the Commissary department and general equipment of a Naval hospital for any number of patients up to 2,000. This includes not only the equipment of the various wards and divisions of the hospital, but also the procuring of the food, its inspection and the supervision of the preparation of special diets for the patient.

Transportation.—The transportation of wounded and sick on board ship is often a difficult problem, and requires knowledge and skill in the methods of handling, the use of stretchers and ambulances, and the preparation of the injured for transportation. This duty falls entirely upon the Hospital Corps.

First Aid.—As the hospital corpsman secures experience and rating justifying advancement to the rate of Chief Pharmacist's Mate, he is often placed on "independent duty." Most of the smaller ships of the Navy, destroyers, submarines, mine-sweepers, and cargo ships, need medical aid and the hospital corpsman here serves as the first aid medical officer. Every kind of emergency work may fall to his lot. Sickness, accidents, or other injuries may require his attention at any time. He must be familiar with antidotes to poisons, and all of the many emergency conditions which he may face. This includes, not only the occurrences which may happen aboard ship, but he may be called upon in outlying stations to administer first aid held to the native population.

Laboratory Technique.—Their knowledge of chemistry and microscopy must be sufficient to aid in a proper control over the water supply, to make an examination of foods, carry out such clinical tests as may be demanded, such as blood examination, urine tests, examination of feces, the Widal and Wassermann tests, etc., as any of these may become a part of their duty.

Pharmacy.—As a pharmacist, the hospital corpsman will have charge of the dispensary either in hospitals on land or on board ship. This rarely calls for the manufacture of pharmaceuticals, but must embrace a knowledge of the medicines on the supply table of the Navy as well as those generally used in medical practice and sufficient chemical training to pass upon the quality of these supplies. The ordering and the proper care of the medical supplies and pharmaceutical equipment, together with the bookkeeping records of the department, the compounding of the prescriptions, and the preparation of such materials as the Dakin-Carrel Solution, are a part of the every-day work.

Clerical.—An important function of the hospital corpsman is clerical. The typewriter must be used for reports. They must be familiar with the bookkeeping methods of the commissary department and must be prepared to take charge of or supervise such records. They must supervise the hospital galley (kitchen) and mess-hall, and must oversee the ordering of supplies and are responsible for the storage and quality of foods. They must be familiar with all forms used in the medical corps, and be able to properly prepare them. These forms include records of enlistment, discharge, medical examinations, laboratory tests, sick and death reports, request for leave, official correspondence, etc.

Hygiene and Sanitation.—At any time the hospital corpsman may be detailed to serve on shore duty with the marines. Here he occupies the important position of sanitary officer. He must be qualified to establish a camp, look after the water supply, examine the quality of water available, and if necessary, purify it for the troops, take care of all refuse about the camp, establish proper latrines, provide bathing facilities and install and superintend the operation of incinerators for the disposal of all sewerage and refuse. In this service, he must also be prepared to establish and equip a field hospital and superintend its management, as has already been outlined.

This account of the varied duties of hospital corpsmen of the

Navy shows the important place occupied by this branch of the military service. Their work has been so admirably conducted that Naval commanders are now asking for many more men trained in this special branch of the service. The development of the Corps has been slow but it has clearly proven its importance and the need for its existence is being more generally recognized. At the present time, the temporary rank of lieutenant, has been authorized by the Secretary of the Navy and the Surgeon General. The temporary rank of Lieutenant, Medical Corps may not become permanent for the hospital corpsman. This was only a war measure. If those members of the Corps, now holding the temporary rank of lieutenant, were required to pass the examinations for Passed Assistant Surgeon, they would not be able to qualify, since these examinations are for graduates of medical schools. Their work, however, fully justifies the advanced rank they have been given.

The Naval authorities have shown that they recognize the importance of this Corps, through granting these temporary commissions. The Corps has proven its worth, and many members of the Naval Medical Corps and other Naval officers, who have seen the work of the Hospital Corps during the war, are proud of the work it has accomplished. Members of the medical corps of the Army, who have observed Naval Pharmacists at work on transports, have expressed their appreciation of the organization, training and ability.

It will be seen by pharmacists that the duties of members of this corps are far broader than the usual activities of the apothecary in civil life, although pharmaceutical training in accordance with the curriculum of a modern college of pharmacy embraces a large percentage of the work demanded of the hospital corpsmen. The full recognition of pharmacy in the Navy with its related activities, as the collaborator with the physician, in the maintenance of health, treatment of disease, and the healing of wounds, has been established and every pharmacist in the country should lend his aid to the Naval authorities.

Men who secure commissions are required to successfully pass severe competitive examinations. Naval pharmacists firmly believe in proper control over the granting of commissions to Pharmacists in the Navy, and with the new light which has come to all who are interested in the Medical Department of the Navy and in the work of its Pharmacists and Hospital Corpsmen, the N. P. S. A. may well be proud of the work that has been done by pharmacists

in the Naval service and glad of the recognition the Navy has accorded them.

E. FULLERTON COOK,
Secretary, N. P. S. A.

PLANTS USED AS INSECTICIDES.[1]

BY R. C. ROARK.

(Continued from page 37.)

ECHINOPS ECHINATUS Roxb. *Compositæ.*

"The roots are pounded and applied to the hair to destroy lice, also the powdered roots applied to wounds in cattle to destroy maggots." (Burkill, quoted by Greshoff, 1913.)

ERIGERON VISCOSUS. *Compositæ.*

In Greece, bunches of this plant are hung over the beds, and all insects that alight upon it are held fast by its sticky exudation. Landerer found that fumigation with it did not narcotize insects as is the case with Caucasian pyrethrum, but did drive them away. (Landerer, Bonplandia, Vol. 10, No. 22, November 15, 1862, p. 342.)

Erigeron viscosus is one of the most frequent plants of Greece where it is called psyllochorton, or flea-plant. Being very viscous before flowering, it is placed in the beds of children to attract the fleas, which adhere to it. The fumes of the burning plant have the same stupefying effect upon the mosquitoes, Sknipes-kenopes (*Culex pipion*) as fumigations of Caucasian insect powder. (Landerer, Am. J. Pharmacy, 4th series, Vol. 5, November, 1875, pp. 498–499.)

EUCALYPTUS GLOBULUS Labill. *Myrtaceæ.* Blue Gum-tree. Victoria and Tasmania.

Leaves = Eucalyptus U. S. P. IX.

Branches of Eucalyptus will drive mosquitoes and other insects out of rooms. (von Mueller.)

EUPATORIUM AMARISSIMUM L. *Compositæ.*

Listed as an insecticide by Greshoff.

[1] Contribution from the Insecticide and Fungicide Laboratory, Miscellaneous Division, Bureau of Chemistry, Department of Agriculture, Washington, D. C.

EUPATORIUM CAPILLIFOLIUM (Lam.) Small. *Compositæ.* Dog-fennel.

It is used to keep off insects and bugs by strewing on the floors of cellars and dairies. (Porcher.)

EUPATORIUM PERFOLIATUM L. *Compositæ.* Synonym: *Eupatorium connatum* Michx. Eastern U. S. Boneset.

The powdered leaves applied to the plant seemed obnoxious to cotton worms (*Aletia*), but the infusion from the leaves was ineffective. (Riley.)

EUPHORBIA BICOLOR. *Euphorbiaceæ.*

"The juice of *E. marginata* and *E. bicolor* is used to some extent in Texas to brand cattle, it being held to be superior to a red-hot iron for that purpose, because screw worms will not infect the fresh scar and the spot heals more readily." (Chesnut, U. S. Dept. Agr. Bur. Animal Industry, 15th Ann. Rept., 1898, p. 407.)

EUONYMUS AMERICANUS L. *Celastraceæ.* Strawberry Bush. Eastern U. S.

"The seeds are said to be nauseous, purgative and emetic, and are used in some places to destroy vermin in the hair. The leaves are poisonous to cattle." (Porcher.)

EUONYMUS ATROPURPUREUS Jacq. Wahoo. Eastern U. S.

Possesses properties similar to the above. (Porcher.)

EUONYMUS EUROPÆUS L. Spindle-tree. Europe, adv. in U. S.

Seeds emetic, purgative, insecticide. (Lyons.)

FLUGGEA LEUCOPYRUS. *Euphorbiaceæ.*

Leaves used as an insecticide. (Dymock, quoted by Greshoff, Kew. Bull., No. 10, 1909, p. 417.)

GOUANIA DOMINGENSIS L. *Rhamnaceæ.* Chew-stick. West Indies and Brazil.

GOUANIA TOMENTOSA Jacq.

These, and other species of *Gouania,* are used as insecticides. (Greshoff, 1913.)

GYMNOCLADUS DIOICA (L.) Koch. *Cæsalpinaceæ.* Synonyms: *Gymnocladus Canadensis* Lam. (Kew), *Guilandina dioica* L. Kentucky Coffee Tree. Eastern U. S.

Insects preying on the foliage of this tree are poisoned by it. (von Mueller.)

In the south the leaves are used as fly poison. (Pammel.)

The leaves and fruit pulp have been used, when rubbed up with milk, to poison flies. (Chesnut, U. S. Dept. Agr. Div. Bot. Bull. 20, 1898, p. 28.)

HAPLOPHYTON CIMICIDUM A. DC. *Apocynaceæ.*

Arizona to Guatemala and Cuba.

Listed as an insecticide by Greshoff.

HEDEOMA PULEGIOIDES (L.) Pers. *Labiatæ.* Synonyms: *Mellisa pulegioides* L. 1753, *Cunila pulegioides* L. 1762, *Ziziphora pulegioides* Desf. Pennyroyal. Eastern U. S.

No result upon cotton worms (*Aletia*) was observed from the applicatioin of the alcoholic extract, decoction or infusion. (Riley.)

Source of the official oil of Pennyroyal; also used to drive away mosquitoes. (Lyons.)

HELENIUM AUTUMNALE L. *Compositæ.*

HELENIUM TENUIFOLIUM Nutt. Sneeze-weed. Eastern U. S.

This plant rendered the cotton plant obnoxious to worms (*Aletia*) so that they would not feed upon it, but did not kill them. The decoction, infusion and alcoholic extract were without effect, as were likewise the dried flower heads. (Riley.)

Riley also states: "The universal belief that these two species of dog-fennel are never attacked by any insect is without foundation. We found a small Longicorn borer (larva of *Mecas inornata*) boring in the stem; an unnamed species of *Baris* bores in the root, while the flower-heads are badly infested by several species of *Brachytarsus.*"

HELIOTROPIUM INDICUM L. *Borraginaceæ.* Indian Heliotrope.

The decoction produced no effect upon cotton worms (*Aletia*). (Riley.)

HELLEBORUS ANTIQUORUM A. Braun, ERANTHIS HYEMALIS (L.) Salisb., HELLEBORUS NIGER L., HELLEBORUS ORIENTALIS, HELLEBORUS VIRIDIS L. *Ranunculaceæ.*

HICORIA GLABRA (Mill.) Brit. *Juglandaceæ.* Synonyms: *Juglans glabra* Mill., *Carya porcina* Nutt., *Hicoria porcina* Raf. Pignut, Pig-nut Hickory. Eastern U. S.

An infusion of the leaves in water and washing a horse with

them in fly-time, prevents the annoyance of those insects. (Williams, Trans. Am. Med. Assoc., Vol. 2, 1849, p. 920.)

All the species serve as insecticides. (von Mueller.)

HIPTAGE MADABLOTA Gaertn. *Malpighiaceæ.*

An insecticide. (Greshoff, 1913.)

HYDNOCARPUS ANTHELMINTICA Pierre. *Bixaceæ.*

The seed is used as an insecticide. (Greshoff, 1913.)

INDIGOFERA TINCTORIA L. *Fabaceæ.* Synonym: *Indigofera indica* Lam., not Mill. East Indian Indigo Plant. Tropical countries.

In Jamaica it is employed to destroy vermin. (Porcher.)

The seeds yield a tincture which is used to destroy lice. (Pharmacogr. Ind., quoted by Greshoff.)

INULA PULICARIA L. *Compositæ.*

Flowers of this were entirely inactive against flies. (Kalbruner.)

INULA SQUARROSA (L.) Bernh. Synonym: *Conyza squarrosa* L., *Inula Conyza* DC. Plowman's Spikenard. Europe.

Herb diuretic, emmenagogue, insecticide. (Lyons.)

JUGLANS NIGRA L. *Juglandaceæ.* Black Walnut, American Walnut. Ontario and Eastern U. S.

Walnut leaves soaked in water for some hours, then boiled and applied to the skins of horses and other animals, will prevent their being bitten or worried by flies. (Porcher.)

Riley reports on the action of the alcoholic extract and decoction on cotton worms (*Aletia*) as follows: "A substance which, especially in the form of decoction, deserves further attention. It has no effect on the worms upon contact, but renders the leaves decidedly distasteful to them. On the second day after application the leaves which had received a large amount of the decoction remained fully intact; the worms having removed to the lower branches and to those portions of the plants which were not, or but little, treated with the decoction. Several worms kept in captivity without food except leaves drenched with this decoction finally fed upon them and successfully changed to pupæ. The decoction stains the leaves dark brown, but apparently without injuring them."

JUNIPERUS HORIZONTALIS Moench. *Pinaceæ.* Synonym: *Sabina*

officinalis Garcke. Savin. Europe, northern Asia and North America.

A decoction of the tops serves as an insecticide. (Greshoff.)

JUNIPERUS VIRGINIANA L. Red Cedar. Eastern U. S.

The use of red cedar boxes for storing woolens to protect them from moths is well known.

The leaves also prevent the attacks of insects when spread over cloth. (Porcher.)

LEDUM GROENLANDICUM Oeder. *Ericaceæ.* Synonym: *Ledum latifolium* Ait. Labrador Tea. Northern U. S.

It is said to kill lice, insects, etc. (Williams, Trans. Am. Med. Assoc., Vol. 2, 1849, p. 916.)

LEDUM DECUMBENS (Ait.) Lodd. Wild Rosemary. Northern Europe, Asia and North America.

This plant kills lice, bed-bugs, fleas, moths, and other insects. It is most active when green and in blossom, but the dried material is also effective. (Ztschr. allg. oesterreichischen Apotheker-Vereines, Vol. 13, July 20, 1875, p. 346.)

The leaves and twigs are used as an insecticide. (Lyons.)

LINARIA LINARIA (L.) Karst. *Scrophulariaceæ.* Synonyms: *Antirrhinum Linaria* L., *Linaria vulgaris* Mill. Toad Flax. Europe, nat. in U. S.

The expressed juice mixed in milk is a poison to flies, and the smell of the flower also kills them. (Williams, Trans. Am. Med. Assoc., Vol. 2, 1849, p. 917.)

LINUM USITATISSIMUM L. *Linaceæ.* Flax. Europe and Asia, cult. in U. S.

The oil from flaxseed will also destroy all kinds of animals infesting quadrepeds, when rubbed into the skin. (Porcher.)

LYCOPERDON BOVISTA L. *Lycoperdaceæ.* Synonyms: *Lycoperdon giganteum* Batsch., *Bovista giganteum* Nees., *Lycoperdon caelatum* Frice. Giant Puffball.

Used in its mature condition as a styptic and for stupefying bees. (Kew Guide, quoted by Greshoff.)

LYCOPERSICON LYCOPERSICON (L.) Karst. *Solanaceæ.* Synonyms: *Lycopersicon esculentum* Mill. (Kew), *Solanum Lycopersicum* L. *Lycopersicum Solanum—Lycopersicum* Hill. Tomato. South America, cult. everywhere.

"Tomato foliage may be placed round fruit trees, like the equally poisonous potato leaves, to prevent the access of insects, and an infusion of the herb serves also as an insecticide for syringing, as first adopted by Mr. Sircy." (von Mueller.)

LYCOPODIUM COMPLANATUM L. *Lycopodiaceæ.* Ground Pine. Europe, Asia and North America.

The decoction kills lice. (Williams, Trans. Am. Med. Assoc., Vol. 2, 1849, p. 924.)

LYCOPODIUM SELAGO L. Fir Moss; Tree Moss.

Listed by Greshoff as an insecticide.

LYSIMACHIA NUMMULARIA L. *Primulaceæ.* Creeping Loosetrife. Europe, nat. in U. S.

The leaves and flowers, steeped in oil, have the power of destroying insects and worms which infest granaries. (Porcher.)

MACLEYA CORDATA (Willd.) R. Br. *Papaveraceæ.* Synonym: *Bocconia cordata* Willd. Tree Celandine. Japan.

The decoction is used in Japan as an insecticide. (Greshoff.)

MARRUBIUM VULGARE L. *Labiatæ.* Horehound. Europe and Asia, nat. in U. S.

In experiments with insecticides on the cotton worm (*Aletia*) Riley reports as follows on horehound: "This decoction emits a very powerful and disagreeable stench, which I could still smell on the cotton plants two days after application, but it had no effect whatever on the worms, nor did it prevent the moths from ovipositing. The alcoholic extract did not possess this unpleasant smell, and had likewise no effect whatever."

MATRICARIA CHAMOMILLA L. *Compositæ.* Synonyms: *Chrysanthemum Chamomillla* Bern.. *Chamomilla vulgaris* S. F. Gray, *Chamomilla officinalis* Koch. German Chamomile. Europe and Asia, nat. in U. S.

Flowers = Matricaria U. S. P. IX.

In Portugal it is planted under fruit trees for insecticidal purposes. (von Mueller.)

Flower heads of common chamomile have an action similar to that of genuine Persian insect powder (*Pyrethrum roseum* and *P. carneum*). (Schenck, Canstatt's Jahresbericht, Band V, 1859, p. 11.)

Heads of this exert a similar effect on insects as pyrethrum. (Gieseler, Proc. Am. Pharm. Assoc., Vol. 10, 1862, p. 112.)

Chamomile flowers, if pulverized when dried, and perfectly fresh, have a somewhat similar effect on the oriental cockroach as pyrethrum. (Glover, Rept. U. S. Commissioner Agr., 1874, p. 133.)

Chamomile powder is inert toward roaches. (Hirschsohn, Pharm. Zeitschrift für Russland, Vol. 29, No. 14, April 8, 1890, p. 203.)

MATRICARIA INODORA L.

The flowers have a benumbing effect on flies, acting in 1 to 2 hours. (Kalbruner.)

MATRICARIA MATRICARIOIDES (Less) Porter.

In California *M. Matricaroides* seems to serve similarly medicinal purposes. (von Mueller.)

MELANTHIUM VIRGINICUM L. *Melanthaceæ.* Common Bunchflower. Eastern U. S.

These bunchflowers have long been used to poison flies. (Pammel.)

Root used as a fly poison. (Lyons.)

MELIA AZADIRACHTA L. *Meliaceæ.* *Azadirachta Indica* Juss., *Azadarach deleteria* Medic. Nin Tree. East Indies. Source of Assam or Bengalore gum.

Furniture from its wood is not attacked by insects. (von Mueller.)

MELIA AZEDARACH L. Synonyms: *Azedarach Commelini* Medic., *Azedarach odoratum* Noronha. Pride of India. China to India. Cult. in Florida.

The leaves are insecticidal. (von Mueller and Lyons.)

A poultice of the flowers is said to kill lice. (Watt, quoted by Greshoff.)

Peach trees shaded by this tree are never infested by the aphis. (Porcher.)

The leaves and berries of the Pride of India, packed with dried fruits, will preserve them from insects, and will prevent moths in clothes. . . . The wood is beautifully grained, . . . never being injured by worms. (Porcher.)

A solution or decoction made with the berries of the Pride of India (to a half bushel of the berries put into a barrel add fifteen

gallons of water, and let them soak one or two days) and sprinkled with a water-pot over the plant, will, in most cases, prevent the depredation of the black grub, or cutworm. (Porcher.)

Riley reports tests made by his assistants with this plant as follows:

"I sprayed a decoction of leaves and small twigs on the cotton plants, and I think it had a large effect in preventnig the moths of *Heliothis* and *Aletia* from ovipositing, but it did not destroy the larvæ. The alcoholic extract of the berries and leaves adulterated with twice its quantity of water was sprayed on twelve *Aletia* larvæ, full-grown; most of them fell to the ground, and four died. This experiment was repeated with about the same result; but when the extract was diluted with ten parts of water it failed to bring the worms to the ground." (R. W. Jones.)

"This plant, in the form of alcoholic extracts as well as decoctions, undoubtedly possesses some insecticide properties, acting upon the worms by contact, but in a manner quite different from pyrethrum and kerosene. The acting principle seems to be of a narcotic nature, the worms not showing any unusual disturbance after application. They seem to get benumbed, and, gradually losing their strength, finally loosen their hold and drop to the ground, where they lie without falling in convulsions. The more full-grown worms are, however, but little affected, and of the smaller ones a large proportion recover. This is the most promising plant of the whole number I experimented with, though the extracts and decoctions as applied by myself are altogether too weak to be used as a remedy for the worms. The preparations made from the berries are evidently more effective than those from the leaves. . . . For further experiments I would recommend preparations from the *dried* green berries." (E. A. Schwarz.)

MENTHA PULEGIUM L. *Labiatæ.* Synonym: *Pulegium vulgare* Mill. European Pennyroyal, Flea Mint. Europe.
Serves as an insecticide. (von Mueller.)

MENTHA SPICATA L. Synonyms: *Mentha spicata* var. *viridis* L. 1753, *Mentha viridis* L. 1763 (Kew), *Mentha sylvestris* var. *glabra* Koch. Spearmint. Europe, nat. in U. S. Leaves and tops = Mentha viridis U. S. P.

With cotton worms (*Aletia*) no result was obtained with the alcoholic extract of this plant. (Riley.)

MILLETTIA AURICULATA Baker. *Leguminosæ.*

The root is used as an insecticide. (Greshoff, 1913.)

MONARDA PUNCTATA L. *Labiatæ.* Horsemint. Eastern U. S.

The alcoholic extract of the leaves was ineffective against cotton worms (*Aletia*). (Riley.)

MYRICA CERIFERA L. *Myricaceæ.*

Maryland to Florida, west to Texas.

The Welsh lay branches of it upon and under their beds to keep off fleas and moths. (Quoted by Porcher.)

NELUMBO LUTEA (Willd.) Pers. *Nelumbonaceæ.* Synonym: *Nelumbium luteum* Willd. American Lotus Lily. Eastern U. S.

According to Schaffner it is said to be used to destroy cockroaches. (Pammel.)

NERIUM OLEANDER L. *Apocynaceæ.* Synonym: *Oleander vulgaris* Medic. Oleander. Mediterranean region.

The bark is very frequently used for the destruction of rats and insects. (Ed. Schaer, Arzneipflanzen als Fischgifte, 1897; quoted by Greshoff.)

NICOTIANA TABACUM L. *Solanaceæ.* Tobacco. Tropical America.

The use of tobacco powders and extracts (nicotine) for insecticidal purposes is well known.

PACHYRHIZUS TUBEROSUS Spreng. *Leguminosæ.* Synonym: *Dolichos tuberosus* Lam.

The seeds (in decoction or in the form of powder) are used in Merida (Venezuela) for killing vermin. (Ernst, quoted by Greshoff.)

PADUS VIRGINIANA (L.) Mill. *Rosaceæ.* Synonyms: *Cerasus serotina* Lois, *Prunus virginia* L. Black Cherry. Eastern U. S. Bark = Prunus Virginiana U. S. P.

PERSICARIA HYDROPIPER (L.) Opiz. *Polygonaceæ.* Water-pepper. Smartweed. Europe, nat. in U. S.

Neither the decoction nor alcoholic extract of the leaves was effective against cotton worms (*Aletia*). (Riley.)

It is found a convenient and useful application for driving off

flies from wounds, occurring on cattle for instance. (Flora Scotica, p. 207, quoted by Porcher.)

Not infested by caterpillars. (Fernow, quoted by von Mueller.)

PHILADELPHUS CORONARIUS L. *Hydrangeaceæ.* Mock Orange. Europe, cult. in U. S.

This is recommended as an insecticide all over the South, for the only reason, it seems, that it is injurious to stock. Decoction, infusion, and alcoholic extract had no effect whatever on cotton worms (*Aletia*). (Riley.)

PHYSALODES PHYSALODES (L.) Brit. *Solanaceæ.* Synonyms: *Atropa Physalodes* L., *Nicandra Physaloides* (L.) Pers., *Physalodes peruvianum* Kze. Apple of Peru. Peru, cult. and adv. in U. S.

Used as a fly poison in parts of the United States. (Pammel.)

PHYTOLACCA AMERICANA L. *Phytolaccaceæ.* Poke-weed. Ontario and eastern U. S. Root = Phytolacca U. S. P.

Dr. Renner, of Maryland, states that the root in either a fresh or dried state is poisonous to cockroaches, and that he and his neighbors have used it with good effect. (Glover, Rept. U. S. Commissioner Agr., 1874, p. 133.)

Riley reports results by his assistants as follows: "Decoction of leaves and berries; also alcoholic extract from the dried root. No result." (R. W. Jones.) "I did not obtain any effect with the decoction prepared by Messrs. Jones and Roane, but a very small quantity prepared by Professor Barnard had a decided effect, killing the young worms and seriously affecting the older ones. It was applied undiluted, by means of a hand atomizer. The extract acted upon contact in a very short time, the young worms falling in convulsions of short duration before dying. The old worms had all recovered the second day. Professor Barnard afterwards told me that this extract was a very strong one." (E. A. Schwartz.)

PICRAENA EXCELSA Lindl. (Kew). Synonyms: *Quassia polygama* Linds., *Picrasma excelsa* Planch, *Simaruba excelsa* DC., *Quassia excelsa* Swz. Jamaica Quassia. West Indies.

The use of quassia wood as an insecticide is well known.

PICRASMA AILANTHOIDES Planch. *Simarubaceæ.* Nigaki of Japan.

Decoction of the bark used to kill lice. (Batchelor, quoted by Greshoff.)

PICRASMA QUASSIOIDES Benn. Synonym: *Nima quassioides* Ham. Northern India.

Possesses insecticidal properties. (Lyons.)

PIERIS OVALIFOLIA D. Don. *Ericaceæ.* Synonym: *Andromeda ovalifolia* Wall.

A useful insecticide. (Watts, quoted by Greshoff.)

PINUS PALUSTRIS Mill. *Pinaceæ.* Synonym: *Pinus australis* Michx Long-leaved Pine. Virginia to Florida and Texas.

Resinous exudate is turpentine, of which Wilson (quoted by Porcher) says: "Turpentine is one of the best means of chasing away fleas whether from place or animal, and a bed of very fine shavings of some wood which abounds in turpentine is one of the easiest and most effectual means of banishing them from dogs."

PODOPHYLLUM PELTATUM L. *Berberidaceæ.* Mandrake, May Apple. Eastern U. S.

No result upon cotton worms (*Aletia*) was observed upon the application of the powdered dried root of this plant, nor upon the application of the powder stirred up in water. (Riley.)

POGOGYNE PARVIFLORA Benth. *Labiatæ.*

"Many of the Indians place the culled plants in or about their houses to drive away flies." (Chesnut, U. S. Dept. Agr. Div. Bot. Contributions from the U. S. Nat. Herbarium, Vol. VII, No. 3, 1902, p. 384.)

PRUNUS SPINOSA L. Sloe; Blackthorn. Europe.

Hardly at all liable to be attacked by insects. (von Mueller.)

PTERIDIUM AQUILINUM (L.) Kuhn. *Polypodiaceæ.* Common Brake.

In Austria the leaves are placed in the bed as a protection against vermin. (Pharmaceutische Zeitung, Vol. 37, No. 103, December 24, 1892, p. 798.)

PULICARIA DYSENTERICA (L.) Gaertn. *Compositæ.* Synonym: *Inula dysenterica* L. Fleawort. Southern Europe.

Herb insecticide. (Lyons.)

PYRETHRUM CALAMITA. *Compositæ.*

Heads of this exert an effect on insects similar to that of Persian insect powder. (Gieseler, Proc. Am. Pharm. Assoc., Vol. 10, 1862, p. 162.)

According to Browne (Rept. U. S. Com. Patents, 1857, Agriculture) Persian insect powder is produced from this species as well as from *P. roseum* and *P. carneum.*

RHINANTHUS CRISTA-GALLI L. *Scrophulariaceæ.* Synonym: *Rhinanthus minor* Ehr. (Kew). Rattle; Rattle-box. Northern Europe, Asia and North America.

Plant insecticide. (Lyons.)

RHUS CORIARIA L. *Anacardiaceæ.* Tanner's Sumac. Europe.

Carvés records that this plant when in proximity of vines infested by *Phylloxera vastatrix,* destroys this insect. (Sorauer, quoted by von Mueller.)

RICINUS COMMUNIS L. *Euphorbiaceæ.* Synonyms: *Ricinus vulgaris* Mill., *Ricinus medicus* Forsk., *Cataputia minor* Ludw. Castor-oil Plant. Southern Asia.

Castor-oil plants have been found efficacious in freeing rooms from insect life, the leaves of the plant containing a substance which is fatal to flies and other insects. (Chemist & Druggist, Vol. 29, Sept. 25, 1886, p. 410.)

It also helps to drive mosquitoes away. (von Mueller.)

ROSMARINUS OFFICINALIS L. *Labiatæ.* Rosemary. Mediterranean region.

Branches of this shrub will keep off moths from wearing apparel packed away. (von Mueller.)

ROYLEA ELEGANS Wall. *Labiatæ.*

The leaves used as an insecticide. (Greshoff, 1913.)

RUMEX sp. *Polygonaceæ.* Dock Weed.

An alcoholic extract was without effect upon cotton worms (*Aletia*). (Riley.)

RUTA GRAVEOLENS L. *Rutaceæ.* Rue. Southern Europe.

A strong decoction obtained by macerating the leaves of the plant in soap and water, is stated by Forney to be a successful remedy for American blight. (Larbaletrier, Year-Book of Pharmacy, 1902, p. 276.)

SAMADERA INDICA (Gaertn.) *Simarubaceæ.* Synonyms: *Locandi indica* Gaertn., *Samandera pentapetala* C. Don., *Niota pentapetalla* Lam., *Niota Commersoni* Pers.

Hindustan. Bark = Niepa bark; Niota bark.

Listed by Greshoff as an insecticide.

SAMBUCUS CANADENSIS L. *Caprifoliaceæ.* American Elder. U. S.

A decoction made by pouring boiling water over the leaves, flowers or berries of the elder is recommended as a wash for wounds to prevent injury from flies. (Porcher.)

SAMBUCUS NIGRA L. European Elder. Europe.

The leaves of the English elder (*Sambucus nigra*) kill several species of noxious insects. (Porcher.)

"It is said, if fruits are whipped with the green leaves and branches of elder, the insects will not attack them." (M. Cutler, 1785, quoted by Greshoff, 1913.)

SANTOLINA CHAMÆCYPARISSUS L. *Compositæ.* Synonym: *Chamæcyparissus villosa* Mill. Lavender Cotton. Mediterranean region.

Listed by Greshoff (1913) as an insecticide.

SASSAFRAS SASSAFRAS (L.) Karst. *Lauraceæ.* Synonyms: *Laurus Sassafras* L., *Sassafras officinale* Nees, not Sieb., *Laurus variifolius* Salisb. Sassafras; Cinnamon-wood. Eastern U. S. Bark of root = Sassafras U. S. P.

Bedsteads made of it are never infested with bugs. (Porcher.)

Riley found the alcoholic extract from the dried bark of the root ineffective against cotton worms (*Aletia*).

From the root oil of sassafras is obtained, which is an insect repellant.

SAUSSUREA LAPPA C. B. Clarke. *Compositæ.* Synonyms: *Aplotaxis Lappe* Decaisme, *Aucklandia Costus* Falconer. Costus Root; Cashmere. North Temperate Zone.

The aromatic root of this tall perennial species is of medicinal value. . . . It is said that the annual export has been as much as one thousand tons, a large portion used for incense, further as an insecticide, keeping moths from cloth; the leaves for the same reason being used as emballage for shawls. (De Rinzi, quoted by von Mueller.)

SCHKUHRIA ABROTANOIDES Roth. *Compositæ.* Peru to Argentina.

This annual herb yields locally an insecticidal powder. (von Mueller.)

The flowers of this are used in Peru for the same purpose as insect powder. (Haas, Pharm. Centralhalle für Deutschland, neue folge, Jahrgang V, No. 2, January 10, 1884, p. 19.)

SIDEROXYLON BORBONICUM A. DC. *Sapotaceæ.* Synonym: *Sideroxylon Inerme* L.

Listed by Greshoff as an insecticide.

SOLANUM AURICULATIUM Ait. *Solanaceæ.*

A decoction of the berries is used as an insecticide. (Greshoff, 1913.)

SOLANUM CAROLINENSE L., SOLANUM CORNUTUM. Horse Nettle. Eastern U. S.

Riley found the decoction of this ineffective against cotton worms (*Aletia*).

SOPHORA FLAVESCENS Ait. *Leguminosæ.*

A decoction of the stems and leaves is used in Japan as an insecticide. (Greshoff, 1913.)

SOPHORA GRIFFITHII Stocks. Synonym: *Keyserlingia Griffithii* Boiss.

The seed is used powdered and mixed with oil to kill lice in the hair. (Burkill, quoted by Greshoff, 1913.)

SYNANDROSPADIN VERMITOXICUS Engl. *Araceæ.*

The poisonous bulbs serve for the destruction of injurious insects. (Engler, quoted by Greshoff.)

TAGETES GLANDULIFERA Schranck. *Compositæ.* South America.

This vigorous annual plant is said by Dr. Prentice to be pulcifugous. (von Mueller.)

TAMUS COMMUNIS L. *Dioscoreaceæ.* Black Briony. Europe.

The powdered root has been recommended to destroy lice in children's heads. (Dujardin Beaumetz, quoted by Greshoff.)

TANACETUM VULGARE L. *Compositæ.* Synonyms: *Chrysanthemum Tanacetum* Karsch, *Pyrethrum Tanacetum* DC. Tansy. Europe and northern Asia, cult. and nat. in U. S.

The flowers of Tansy are also said to have a stupefying effect on insects. (Simmonds, Am. J. Ph., 4th series, Vol. 21, April, 1891, p. 202.)

The alcoholic extract and infusion were without effect on cotton worms (*Aletia*). (Riley.)

An action, similar to that of Persian insect powder is produced by the common tansy, which is sold in the north of England for

similar purposes. (Martindale in discussion of Kirkby's paper, Pharm. J. and Trans., 3d series, Vol. 19, September 22, 1888, p. 241.)

Heads exert a similar effect on insects as pyrethrum. (Gieseler, Proc. Am. Pharm. Assoc., Vol. 10, 1862, p. 112.)

Flowers of this were very feebly benumbing to flies. (Kalbruner.)

TRILISA ODORATISSIMA (Walt.) Cass. *Compositæ.* Synonyms: *Anonymos odoratissimus* Walt., *Liatris odoratissimus* Michx. Wild Vanilla, Vanilla-Leaf. Eastern U. S.

The leaves are used to protect woolen clothes from the attacks of moths. (Jackson, Pharm. J. and Trans., 3d series, Vol. 4, October 25, 1873, p. 322.)

TROPÆOLUM MAJUS L. *Geraniaceæ.* Synonyms: *Cardamindum majus* Moench. Common Nasturtium. Peru, cult. in gardens.

Has some insecticidal value, and it is even said that when planted around apple trees it will rid them finally of the wooly aphis. (von Mueller.)

TYLOPHORA FASICULATA Ham. *Asclepiadaceæ.*

Leaves and root generally used to destroy rats and other vermin. Proved fatal to man. (Pharmacogr. Ind., quoted by Greshoff.)

UMBELLULARIA CALIFORNICA Nutt. *Lauraceæ.* Synonyms: *Tetranthera californica* H. & Arn., *Oreodaphne californica* Nees., *Linharia californica* B. & H. California Laurel. Calif. to Puget Sound.

"The leaves appear to be very valuable for driving fleas away. One Indian said that they are very effective if strewn about the yard, and one white man assured me that, after spending $10 to $15 on flea powders in a vain endeavor to drive these insects away, he had used laurel leaves with very marked success." (Chesnut, U. S. Dept. Agr. Div. Bot. Contributions from the U. S. Nat. Herbarium, Vol. VII, No. 3, 1902, p. 351.)

The tree is never attacked by insects, owing, as it is supposed, to the volatile oil it contains. (Heamy, Am. J. Pharmacy, 4th series, Vol. 5, March, 1875, p. 105.)

VERATRUM ALBUM L. *Melanthaceæ.* Synonyms: *Veratrum album* var. *viridiflorum* Mert. & Koch, *Veratrum Lobelianum* Bernh.,

Veratrum viride Roehl. not Ait., N. B. *Veratrum album* Michx. = *V. viride* Ait., *Veratrum album* S. Wats. = *V. californicum* Durande. White Hellebore. Europe and Northern Asia.

Rhizome and rootlets = Veratrum U. S. P. VIII in part.

The powdered rhizome and rootlets constitute the hellebore used as an insecticide.

VERATRUM VIRIDE Ait. Synonyms: *Veratrum album* var. *viride* Baker, *Veratrum album* Michx. not L., *Melanthium virens* Thunb., *Helonias viride* Ker., not *V. viride* Roehl. American Hellebore. North America.

Rhizome and rootlets = Veratrum U. S. P. IX.

Serves like other Veratrums also as an insecticide. (von Mueller.)

VERBASCUM THAPSUS L. *Scrophulariaceæ. Thapsus Schraderi* Opiz., *Verabascum Schraderi* G. Meyer. Common Mullein. Europe and Asia, nat. in U. S.

The alcoholic extract and decoction of leaves were ineffective upon cotton worms (*Aletia*). (Riley.)

VERNONIA ANTHELMINTICA Willd. *Compositæ.* East Indies.

Bruised seeds largely employed as a means of destroying pediculi. (Watt, quoted by Greshoff.)

VERNONIA NOVEBORACENSIS (L.) Willd. Synonyms: *Serratula noveboracensis* L., *Behen noveboracensis* Hill. Iron-weed. Eastern U. S.

The alcoholic extract and decoction were ineffective against cotton worms (*Aletia*). (Riley.)

VITEX AGNUS-CASTUS L. *Verbenaceæ.* Chaste-tree. Mediterranean region.

Flies are believed to avoid the tree, so that when they are troublesome, branches are hung in the huts. (Burkill, quoted by Greshoff, 1913.)

WITHANIA SOMNIFERA Dun. *Solanaceæ.*

Used as an insecticide. (Burkill, quoted by Greshoff, 1913.)

XANTHIUM STRUMARIUM L. *Ambrosiaceæ.* Cocklebur. Europe and Asia, nat. in U. S.

No result was obtained with the alcoholic extract and decoction used upon cotton worms (*Aletia*). (Riley.)

XIMENIA AMERICANA L. *Olacaceæ*. Synonyms: *Ximenia inermis* L., *Ximenia spinosa Salisb.* Tallow-nut; Wild Olive. West Indies.

The crushed rind is frequently applied by the negroes in Africa to the sores of domestic animals to keep off the fleas. (Walwitsch, quoted by Greshoff.)

ZANTHOXYLUM CLAVA-HERCULES L. *Rutaceæ*. Synonyms: *Zanthoxylum carolinianum* Lam., *Fagara Clava-herculis* (L.) Small (U. S. P.), *Fagara carolinianum* (Lam.) Engler, *Zanthoxylum fraxinifolium* Walt., not Marsh., *Zanthoxylum tricarpum* Michx., not Hook. Prickly Ash. Southeastern U. S.

The powdered leaves seemed obnoxious to cotton worms (*Aletia*). (Riley.)

The author does not assume responsibility for the statements made relative to the efficacy of the various plants mentioned above, but merely quotes the statements that have been made by various authors. It is probable that further tests of some of the plants will show that many of the statements made relative to their insecticidal action are in error.

This paper is prepared for the purpose of calling to the attention of entomologists promising insecticidal plants for further investigation. Users and manufacturers of insecticides will not be justified in assuming that all of the statements here quoted, relative to the efficacy of the plants mentioned, are in strict accordance with facts.

THE SEPARATION AND USES OF CACAO SHELL.[1]

BY A. W. KNAPP, B.Sc., F.I.C.

The regulations recently issued by the Food Controller concerning cacao shell in cocoa have brought this subject again into prominence. Since the famous legal case in 1910 when a cocoa powder containing 18 per cent. of shell was found to be genuine, it has received little attention, and now for the first time in England, the amount of shell that may be present in cocoa has been carefully defined.

[1] Reprinted from the *Journal of the Society of Chemical Industry*, July, 1918.

The quantity of shell produced every year is sufficiently great to make the subject of interest to those who have to consider the scientific use of waste products. By calculation from the official returns on cacao, the world-production of cacao shell is found to be about 36,000 tons per year, of which Europe consumes 22,000 tons. The consumption in Great Britain in 1916 was 4773 tons.

The raw cacao beans of commerce are about the size of almonds and have a thin skin or shell. This averages about 12.5 per cent. by weight; the percentage varies with the size and method of production of the beans. Thus, when the shell has been washed, as in the case of the cacao from Ceylon, it amounts to about 8 per cent., whereas with Trinidad cacao, which is clayed, it varies around 15 per cent.

In the cleaning of the beans a small amount (about 0.2 per cent.) of loose shell fragments is separated. The shell cannot be easily separated from the bean in the raw state, but after roasting, the shell no longer adheres to the bean. It has apparently always been the custom to remove the shell,. and to use only the kernels for the preparation of cocoa or chocolate; thus Willoughby in his "Travels in Spain" (1664) writes "They first toast the berries to get off the husk," and R. Brookes in his "Natural History of Chocolate" (1730) says: "The Indians . . . roast the kernels in earthen pots, then free them from their skins, and afterwards crush and grind them between two stones."

After roasting, both the shell and bean are crisp and brittle, and the small hard radicle, or germ, is loose. All that is necessary to get them in a suitable condition for separation is to crush the bean with as little breaking down to powder as possible, so that the shell is in large solid fragments (nibs). This is frequently accomplished by passing through rolls at such a distance apart that the bean is cracked without being crushed. It may also be effected by using a serrated cone revolving in a serrated conical case. It is usual to pass the broken bean into a germ separator; in these machines use is made of the uniform size and rod-like shape of the germ to effect separation. The germs so obtained naturally contain some nib and fine shell, and this mixture is known as "smalls." The large nib passes on to the husking machine, in which the nib and shell are separated by winnowing in a powerful current of air, the large nib falling through the current, whilst the shell is blown into another compartment. Both nib and shell pass down revolving cylindrical screens,

encountering a larger and larger mesh as they proceed and thus being separated into various sizes. The current of air carries about 0.2 per cent. of the material as dust into a settling chamber. The large shell contains a fair amount of nib and is graded and separated. Starting with 100 parts of raw cacao beans 10½ per cent. of shell is produced. The total "smalls" obtained approach 4 per cent., these "smalls" containing about 36 per cent. of shell. As a result of these separations and the loss which occurs on roasting, only 78.5 per cent. of usable nib is obtained, and this contains about 2 per cent. of shell. Continuous vigilance is required to keep the product up to this standard. The husking machine and shell purifiers occupy a considerable space. Crushing and separating machines to deal with 1 ton an hour occupy 2,200 cubic feet, or roughly to handle 1 lb. of roasted beans per hour requires 1 cubic foot. The space occupied by the "smalls" machine, shell graders, and purifiers would add 50 per cent. We have never heard of any other method of separation of the shell being used.

The price of cacao shell has undergone an extraordinary increase in the last two years. Thus in 1912 the average price was 65s. per ton; in 1913, 1914, and 1915, 70s.; in 1916 it rose to 90s.; in 1917 to 128s.; whilst in may, 1918, it stood at 310s. per ton. The variation in price is even greater than appears from these figures. To appreciate fully the rise we have to deduct the bagging expenses, which are high, shell being a bulky material. Thus the above shell, which is practically free from cocoa, weighs only 9½ lb. per cubic foot (or 32 lb. when ground to powder).

There are other grades of cacao shell from which the manufacturer has not so completely separated the cocoa, and these are more highly priced, *e. g.*,

Grade.	Cacao Nib Present.	Price per ton (Sept.. 1916)
1.	less than 1%	120*s.*
2.	2.8%	130*s.*
3.	10.0%	150*s.*
4.	15.0%	200*s.*

The following are the most representative analyses:

ANALYSES OF CACAO SHELL.

Shell.	Unroasted. Average, Per Cent.	Roasted. Average, Per Cent.	Roasted. Average, Per Cent.	Per Cent.
Water	12.51	4.50	4.87	9.30
Fat	4.23	4.40	2.77	3.83
Ash	10.20	7.30	10.48	8.26
Nitrogen	2.19	2.50	2.34	3.00
Fibre	16.71	14.00	15.63	13.85
Analyst	Zipperer	Booth. Cribb and Richards	Winton, Silverman and Bailey	Smetham

Cacao shells have long been sold in small quantities in Ireland under the name of "miserables" for the preparation of a table decoction. But it was not till this year that they were sold under fancy names at fancy prices, as much as 2s. per lb. being paid in some cases. Whilst a water extract has, no doubt, a small food value, cacao shell should be regarded as a substance capable of producing an inferior stimulating drink rather than as one giving a food beverage. In this connection reference should be made to a recent paper by J. L. Baker and H. F. E. Hulton on "The Analysis of 'Cocoa Teas.'"[2] Cacao shell contains on an average 1 per cent. of theobromine (the figure given in most published and analyses being too low), and this is probably its most valuable constituent when used to prepare a drink. Its proper use is as cattle food; for this purpose until the last six months it was low in price.

Smetham[3] calculated the "food units" as 102, which places cacao shell above maize and meadow hay.

Mr. W. L. Dubois has sent us the following figures, obtained in America, showing the digestible nutrients in 100 lb. of shells: Protein 1.53 lb., fibre 6.45 lb., nitrogen-free extract 40.6 lb., fat 4.91 lb., fuel value 111,079 calories (1 lb. gives 4,404 B.Th.U.). These analytical results have been supported by practical feeding experiments in America, in Germany (see Zipperer), and in Turin by F. Faelli, who obtained an increase in the daily average yield of milk. J. E. Lucas[4] obtained 20 per cent. decrease in amount of milk and 20 per cent increase of fat content. In 1916 it was reported that horses in

[2] *Analyst*, 1918, 43, 189.
[3] J. Lancashire Agric. Soc., 1914.
[4] Bull. Agric. Intell., 1913.

Germany were poisoned by being fed on cacao shells (2¼ lb. per meal). It was suggested that this was due to the theobromine present in the shell. We feel that this is doubtful, considering that cacao shells have so long been used in compound feeding cakes without complaint. It suggests, however, that it is probably unwise to use a high percentage of it in a diet.[5]

Early in 1915 the transport difficulties were so great that manufacturers of cocoa could not get rid of their shell and hence some thought was given to ways of using it. It has been used as fuel. Its calorific value is a little greater than that of wood (varying from 7,400 to 8,600 B.Th.U.), but being very light it needs careful management. It is most effectively used on a gas plant, the only objection being that the tar which it produces has a nauseating odor. The charred residue can be used as a manure. The shell itself has been used as a manure.[6] In experiments at Bournville it was found to decompose in the ground very slowly, and Mr. J. Lodge recommends that the decomposition should be hastened by placing the shell in a heap, soaking well with water, and turning several times previous to use on the land. Used in this way it gave excellent results both as a manure and as a lightener of heavy soils.

The fat in cacao shell can be extracted by solvents, and as "shell fat" is seen on the market from time to time; this is presumably a regular practice on the Continent. This solvent-extracted fat has an unpleasant taste and an odor like tobacco, which renders it unfit for edible purposes. With theobromine fetching fifty shillings a pound the extraction of the theobromine from shell appears a feasible proposition. We know of no firm actually doing this, although presumably either shell or germ is the source of the theobromine now sold. As an experiment we ourselves extracted some sixty pounds, which we had no difficulty in selling.

Shell can be made to give an extract which is equal to some of the coffee substitutes at present sold, and many other applications have been suggested, but the use of shell which is the most interesting and regrettable is in cocoa and chocolate. In Belgium, Switzerland, Austria, Germany, and America, it is illegal to put shell in cocoa or chocolate, the shelled bean being used. In Great Britain until this year the amount of shell that might be present in cocoa and chocolate had not been defined. The Food Controller has now

[5] See "Cacao Shells as Fodder," by A. W. Knapp, *Tropical Life*, 1916, 154.

issued regulations which state that "no person shall manufacture cocoa powder except such powder as contains no more than 5 per cent of shell." A manufacturer "may sell as Grade A. cocoa powder any cocoa powder which contains not more than 2 per cent. of cocoa bean shell." From the point of view of the public and the manufacturer the figures are well chosen, for when every reasonable effort is made on a commercial scale to separate the shell from the nib, about 2 per cent. of shell is left in. These figures have, however, placed the analyst in a difficult position, for there is no process which will accurately determine such small quantities of shell as 2 per cent. and 5 per cent., and with such processes as are available he will need to draw conclusions from his results with considerable caution. Of the many processes that have been suggested we have most confidence in the fiber determination, but the natural variations in shell and in nib are so great as to make the detection of 5 per cent. of shell uncertain.[7]

In conclusion I wish to thank Mr. N. P. Booth for a number of useful suggestions.

OCCURRENCE OF MOULD IN COCOA BUTTER.[1]

By Lily Batten and Hubert W. Bywaters.

Cocoa butter is distinguished among fats by its resistance to influences tending to produce rancidity or mouldiness. A case of extensive growth of a mould in a specimen of cocoa butter is therefore interesting and noteworthy. The specimen in question was a large block of butter weighing about 28 lbs., and it had probably been expressed from the cocoa beans several months before it came under our observation. On being broken, it was noted that towards the center of the block, and extending from the upper to the lower surfaces, were a large number of dull black patches, intermingled with streaks of a brownish yellow tinge; the butter had a granular appearance, the whole somewhat resembling a matured Stilton cheese.

[5] See Annual Report of the Experimental Farms in Canada, 1898, 151, and 1899, 851.

[7] See also Baker and Hulton, *Analyst*, 1918, 43, 197–201.

[1] Reprinted from the *Journal of the Society of Chemical Industry*, July, 1918.

An accidental contamination with dirt was at first suspected, but on microscopical examination the dark material was found to consist of innumerable hyphæ of various kinds, and greenish blue conidia of a fungus. It was difficult to identify the individual genera in this mass, so sterile prune-juice agar medium was prepared, poured into Petri dishes, and subsequently inoculated from various parts of the infected material. In this way colonies of the moulds were obtained and *Penicillium glaucum* and pink yeast were found to occur, but the greater part of the original mass was found to consist of a species of *Aspergillus*. A pure culture of the latter was obtained, and it is believed to be *Aspergillus oryzæ*. According to Lafar[2] this species is of practical importance as a saccharifying fungus, and has been cultivated for centuries in Japan for the production of saké from rice. It grows rapidly on a large variety of liquid and solid media, and is easily cultivated even at room temperature, the optimum being above 30° C. The peculiarities of the conidiophores, sterigmata, and conidia enable the species to be distinguished with comparative ease from most others, but it is similar to *Aspergillus flavus*, except that in the latter the walls of the hyphæ and conidiophores bear irregular outgrowths. The clavate or spherical globule exhibits no definite line of demarcation from the smooth stem. The sterigmata are radial, and bear numerous large spherical conidia measuring about 0.006 Mm. in diameter.

On breaking open the block of infected butter, drops of clear liquid, apparently water, were observed to be present in some of the larger vesicles. Chemical examination showed the infected part to contain 0.13 per cent. of moisture, and it was thought possible that the spores of the fungi had found their way into the butter by this means. To settle this question, the following investigation of the conditions of growth of *Aspergillus* was carried out: *Cocoa* butter in sterilized Petri dishes was inoculated from the infected butter, and it was found that the mould would not grow on ordinary cocoa butter at any temperature from room temperature up to 33° C., which is its melting point.

Evidence of the facilitating influence of water on the growth of the mould in the infected block was then sought by preparing a series of sterile Petri dishes, and into them placing (*a*) ordinary cocoa butter, (*b*) sterilized cocoa butter, and (*c*) solidified emulsion of cocoa butter and water (containing about 30 per cent. of water).

[2] *Tech. Mycol.*, 1910, Vol. II., Pt. II., p. 308.

These were then inoculated with the spores of the fungus. In addition, small blocks of the infected butter were placed in contact with blocks of (*a*) ordinary cocoa butter and (*b*) solidified emulsion of cocoa butter and water. The dishes were then kept at various temperatures from 15° C. up to 33° C., but at the end of three months in no case could fresh growth of the fungus be observed.

However, colonies of fungoid growth had actually developed on a large block of the solidified emulsion of cocoa butter and water which had been kept at room temperature for the same time, and on reconsideration it appeared probable that the comparatively thin films of cocoa butter and water emulsion in the Petri dishes would rapidly become dry during the incubation, any initial growth of the fungus would soon cease owing to the lack of moisture. This view was corroborated by the fact that in a dish where the block of medium was about as thick as the depth of the dish would allow, growth of the fungus was eventually observed at a temperature of about 27° C. The water content of this butter was 2.4 per cent. which is therefore sufficient to enable the mould to grow.

In all cases growth of the mould appeared to become quiescent after a comparatively short time, although subsequent re-inoculation into a fresh plate was again followed by spasmodic growth. In order to ascertain if the arrest of growth is due to lack of water or another substance, a series of blocks of cocoa butter containing from 0–20 per cent. of water in an emulsified state were prepared, and the fungus introduced into the center of the block, instead of being inoculated into the surface layers. Under these circumstances, however, growth continued to be slow, no matter how large the proportion of water present, but it was rather quicker at 27° C. than at either 12° C. or 17° C.

These experiments seem to indicate that although water is necessary for the growth of the mould, yet the cessation of growth is due to a lack of some other food substance. Although nitrogen could not be detected in the original block by the usual tests, it was thought possible that the addition of a nitrogenous substance might render the cocoa butter more suitable for the propagation of the fungus. Sterile Petri dishes were therefore prepared containing a medium of cocoa butter mixed with a small quantity of sterile prune-juice agar. These were inoculated, and, on incubation at 27° C., vigorous fungal growth was observed in less than a week. Fructifi-

cations were also formed in the following days, with development of characteristic conidia.

These results show that no fear need be entertained of ordinary cocoa butter becoming mouldy from the cause under investigation, provided it is kept free from water. If, however, water finds its way into the cocoa butter—and especially if the water contains substances, probably of a nitrogenous nature, which can serve as food for the fungus—then there is a real danger of the cocoa butter becoming mouldy.

Chemical investigation showed that the acid value of the mouldy butter was about 13, but this was largely due to the presence of the fungoid material, for the acid value of the butter after filtering through paper was only 3.8. This figure, although comparatively low, nevertheless indicates a certain amount of free fatty acid in the butter, and suggests the probability of the appearance of rancidity if the growth of the fungus is unchecked.

The greater part of the experimental portion of this investigation was carried out in the Department of Botany of the University of Bristol.

A SIMPLE AND RAPID METHOD FOR THE ESTIMATION OF ALCOHOL IN SPIRITUOUS LIQUORS.[1]

By Nagendra Chandra Nag, M.A., F.I.C., and Panna Lal, M.Sc.

The method for the estimation of alcohol described below is the result of an investigation to devise a simple method for its estimation with a fair degree of accuracy, avoiding distillation.

The method consists of treating a known quantity of spirituous liquor in a glass tube graduated in tenths of a Cc. (or finer graduation if procurable) with an excess of anhydrous potassium carbonate, adding about 5 to 10 per cent. of water in case the percentage of alcohol is above 90. The mixture is then thoroughly shaken and allowed to settle (or preferably centrifuged), when it will separate into a lower layer of solid potassium carbonate, a middle layer of saturated solution of potassium carbonate, and an upper layer of alcohol hydrate corresponding with the formula $4C_2H_5OH, H_2O$, as will appear from the experimental results given below. The

[1] Reprinted from *Jour. of the Soc. of Chemical Industry*, Sept., 1918.

aqueous potassium carbonate solution (middle layer) contains 0.00275 vol. of alcohol hydrate per Cc.

The composition of the alcohol hydrate was determined by density determinations by weighing, as well as by the glass hydrometer at 15.6° C. The results for specific gravity were 0.81961 and 0.8200 respectively, corresponding with 94.04 and 93.92 per cent. of alcohol by volume. The formula $4C_2H_5OH, H_2O$, assigned to the hydrate requires 94.061 per cent. of absolute alcohol by vol., 91.089 per cent. by weight. The alcohol hydrate does not leave any solid residue on evaporation, showing that it does not dissolve potassium carbonate. The coefficient of expansion of the alcohol hydrate as determined by a weight thermometer was 0.001076; calculated theoretically by extrapolation from Tralles' Table II. the value 0.001068 was obtained.

The formula obtained for calculating the percentage of alcohol as the results of experiment and on theoretical grounds is as follows: Percentage of alcohol $= (V + v \times 0.00275)[1 - 0.001068(t - 15.6)] \times 0.7936 \times 94.06 \div W$, where $V =$ volume of alcohol hydrate directly read off in graduated tube in Cc., $v =$ volume of the saturated potassium carbonate solution (middle layer), $t =$ temperature observed during the experiment in °C., $W =$ weight of the sample taken in Gm., 0.00275 is the solubility (in Cc.) of the alcohol hydrate per Cc. of the saturated potassium carbonate solution, as actually found by experiment, 0.001068 is the apparent coefficient of expansion of the alcohol hydrate, 0.7936 is the specific gravity of absolute alcohol (15.6°/15.6°; it is assumed that the graduation of the glass apparatus used had been carried out at 15.6° C.), and 94.06 is the percentage by volume of absolute alcohol present in the alcohol hydrate liberated (upper layer). (This corresponds to percentage composition by weight, alcohol 91.089, water 8,911, the corresponding density being 0.819514.)

If the volume of saturated potassium carbonate solution is less than 2 Cc. the correction for the solubility of alcohol hydrate in potassium carbonate solution may be dispensed with as it does not appreciably affect the result.

In order further to verify the formula given above, 5 Cc. of Merck's alcohol (marked "absolute alcohol, sp. gr. 0.795") was mixed with saturated potassium carbonate solution, some solid carbonate also being added. The strength of the alcohol as calculated by our formula was 99.46 per cent.; the specific gravity observed

by means of a gravity bottle was 0.79536, corresponding to 99.44 per cent. by weight of alcohol.

The percentage of alcohol found in a sample of whiskey was 39.45 using our method, and 39.47 by distillation (using ice).

Numerous estimations have been made in alcohol solutions and spirituous liquors by this simple method and in many cases the results have been tested and confirmed by hydrometer readings. The results obtained were almost identical by the two methods. The point at which there is some slight disagreement between our experimental figures and those of published tables (Tralles' tables), is where the apparent coefficient of expansion of the alcohol hydrate is 0.001076. This might be urged as additional evidence for the existence of this hydrate.

In conclusion it may be mentioned that the method is quite accurate even though not more than 5 Cc. of the liquor under examination be used. Solids in solution do not affect the result. Loss by evaporation is prevented, as distillation is avoided and readings are taken in closed tubes. Ice is not required even if the temperature be high. This method is equally applicable to methyl alcohol.

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CREATININ AND CREATIN IN THE BLOOD.[1]

The more recent quantitative microchemical studies of the blood have indicated that among the non-protein nitrogenous constituents the estimation of creatinin is likely to be of especial service from a diagnostic and prognostic standpoint. There are few, if any, normal nitrogenous components of the urine for which the kidneys are more permeable; so that when creatinin begins to accumulate in undue proportions in the circulating blood, there can be little question as to the seriousness of the finding.

But what constitutes an abnormally high content of creatinin in the blood? Folin and Denis placed the normal limits at from 1 to 1.4 Mg. per hundred Cc.; according to Myers and Fine, who have accumulated exceptionally extensive statistics on this question, the range is set at from 1 to 2 Mg. Other investigators have been in essential accord with such figures. Only Gettler and Baker indi-

[1] From *The Journal of the American Medical Association.*

cate 0.5 Mg. as the upper limit of normality; and they have reported many specimens of normal blood to contain as little as 0.1 Mg. The problem of establishing definitely a standard of composition is further complicated by the fact that creatinin has been demonstrated to occur in the corpuscles as well as in the plasma. Obviously only the plasma component can be concerned directly in the passage of creatinin in or out of the circulation. As a recent writer has expressed it, the accumulation of creatinin in the blood has shown itself to be a useful index of renal insufficiency; but we are as yet unaware whether the excess present in the circulation of a nephritic permeates all the elements of the blood, or accumulates in the plasma alone. If the latter alternative should prove to be correct, the variations of the plasma creatinin in kidney disease would be even more striking than those of the whole blood creatinin, and would form a still more delicate index of the organ's capacity to excrete. A separate study of plasma and whole blood creatinin and creatin in different pathologic conditions might even reveal significant variations in the permeability of the corpuscles for these substances.

Thanks to the researches of Wilson and Plass, of the Johns Hopkins Medical School, and more recently of Hunter and Campbell at the University of Toronto, it seems conclusive now that in general the creatinin of normal human blood is distributed among its different elements at a practically uniform concentration. It is not confined more particularly to either plasma or corpuscles. The figures ascertained for the plasma indicate, therefore, also the true creatinin content of whole blood. According to Hunter and Campbell, the creatinin content of normal human blood plasma ranges under different conditions from 0.7 to 1.3 Mg. per hundred Cc., the average for sixty specimens examined being 1 Mg. This is in substantial agreement with the figures of all the previous workers except Gettler, whose divergent results were reported above.

With respect to the content of creatin in the blood, the conditions are apparently unlike the equal distribution of creatinin. Hunter and Campbell believe that the creatin is chiefly concentrated in the corpuscles. With the method used, exact determinations were unattainable; but it is roughly estimated that the average creatin content of the corpuscles lies between 6 and 9 Mg. per hundred Cc., while that of the plasma is not more than from 0.4 to 0.6. The blood as a whole contains apparently an average of about 3 Mg. per hundred Cc. There seems to be more in the blood of females than

of males. In other words, the corpuscles contain from five and a half to ten times as much creatin as creatinin, while in the plasma it is the latter that is predominant.

The Toronto investigators point out that the blood creatinin is apt to be lower in females than in males, and lower in subjects deprived of exercise than in those leading an active life. It is suggested that the blood creatinin is related to muscular development in much the same way as the creatinin coefficient of the urine. We have already discussed the peculiar occurrence and as yet unknown significance of creatin in the urine. Hunter and Campbell have found this substance present at times in the blood. They state that there is a distinct correspondence between increase of plasma creatin and the appearance of creatin in the urine; but whether the plasma, in the absence of creatinuria, is creatin-free or whether there exists a threshold for creatin excretion has not been positively determined. If there is a threshold, it is a very low one.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

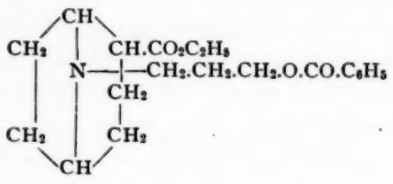
A Rapid Test for Occult Blood.—The benzidine test for occult blood was referred to in these pages (1916, p. 249), when the method of application was described as follows:

To about 5 Cc. of a saturated solution of benzidine in alcohol or glacial acetic acid an equal volume of 3 per cent. hydrogen peroxide solution is added, and then one Cc. of the solution to be tested. If the mixture is not acid, it is made acid with acetic acid. A green or blue color indicates the presence of blood. A control test in which water is substituted for the liquid under examination should give no coloration. The test is said to detect blood in a dilution of one in 300,000.

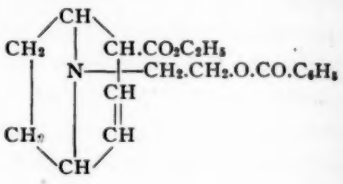
W. T. Vaughan (*Jour. Lab. and Clin. Med.*, 1917, 2, 437, Mar.) gives a simple modification of this test which can be applied by any physician. A few grains of powdered benzidine (as much as will lie on a knife-point), with a few drops of glacial acetic acid and a few drops of hydrogen peroxide, are mixed with a small portion of solid fæces on a glass slide: a greenish-blue fading color is positive. This test, he concludes, is simple, rapid and clean, and is not

too delicate for clinical use. (Reprinted from *The Prescriber*, August, 1918.)

CONVERSION OF COCAINE INTO NEW, PHYSIOLOGICALLY SUBSTANCES.—By a chemical procedure the functional elements of cocaine are rearranged to yield two new active substances: (I) "Mydriasin," as strong a mydriatic and anæsthetic as atropine, chemically



I.



II.

benzoyloxypropylnorhydroecgonidine ester; and (II) "Ekkain," a stronger anæsthetic than cocaine, non-toxic, and sterilizable. Chemically it is N-benzoyloxypropylnorecgonidine ester. It is an oily compound whose hydrochloride melts at 117° and is easily soluble in water, less so in alcohol. (J. v. Braun and E. Müller, *Ber. d. d. chem. Ges.*, v. 51, pp. 235–252, 1918.)

J. F. C.

THE CASEIN OF HUMAN MILK.—Analysis of the casein of human milk yielded the following figures: Nitrogen, 15.75 per cent.; phosphorus, 0.70 per cent.; sulphur, 0.70 per cent. From its combination with bases the molecular weight was calculated to be 8,888 and its valence 8. It was found to resemble the casein from the milk of the cow and of the goat. Rennin produces a paracasein from it similar to the paracasein from cow's milk. (A. W. Bosworth and Louise A. Giblin, *Jour. Biol. Chem.*, v. 35, pp. 115–117, 1918.)

J. F. C.

THE PREPARATION OF PURE CASEIN.—Casein in pure form, free from inorganic phosphorus, calcium, and hydrolytic products, is prepared by treating undiluted milk with normal acid, preferably lactic or a mixture of 1 part of hydrochloric and 2 parts acetic. The acid is introduced slowly into the undiluted milk below the surface, the tip of the tube carrying the acid into the milk being so arranged that it is very close to a mechanical stirrer revolving at high speed and

also near the bottom of the vessel containing the milk. Under these conditions the acid does not cause coagulation of the casein at the point where the acid first comes into contact with a portion of the milk. The ash and phosphorus contents of this casein are unusually low. Casein can be prepared by this method within ten hours; excess of acid and danger of hydrolysis are avoided; the product contains neither inorganic phosphorus nor calcium; it is quickly soluble in dilute alkalies; the yield is practically quantitative. (L. L. Van Slyke and J. C. Baker, *Jour. Biol. Chem.*, v. 35, pp. 127–136, 1918.)

J. F. C.

ORGANIC CRYSTALLINE SUBSTANCES IN GENTIANA GERMANICA.—Two crystalline substances were detected: gentiolutein, a sublimate of yellow needles which is insoluble in water, alcohol, glycerol, aqueous chloral hydrate, olive oil, dilute mineral acids, but is easily soluble in acetone; and a second substance observed after the removal of the epidermis of the leaf and immersion in distilled water or treatment with dilute mineral acids or phenol, alcohol, or glycerol. Neither substance is identical with gentiopicrin or gentianin. The gentiolutein could not be detected in *G. asclepiadea, G. ciliata,* or *G. pneumonanthe.* (Hans Molisch, *Ber. botan. Ges.*, 35, 653, 1917; *C. A.*, 12, 2344, 1918.)

J. F. C.

THE EFFECTS OF VARIOUS AGENTS ON SUPERFICIAL HEMORRHAGE AND THE EFFICIENCY OF LOCAL HEMOSTATICS.—Beginning with the most efficient, the order of efficiency of the more important of all the hemostatic agents tested is epinephrin, pituitary extract, tyramin, acetic acid, ferric chloride, quinine-urea-hydrochloride, tannin, sodium bicarbonate, barium chloride, cane sugar, sodium chloride. A number of other agents, which were tried, can lessen local hemorrhage in variable degrees, but on the whole they are inferior and undesirable for various reasons. The following among the more important of this class and for which hemostatic claims have been made, were found to increase bleeding on local application; cotarnine salts (stypticin and styptol), antipyrin, peptone, emetine, sometimes alum, orthoform (1 per cent. solution) also quite markedly increased local bleeding. Under the conditions kephalin, coagulen, and thromboplastin were all variable, or did not affect the course of

bleeding. (P. J. Hanzlik, *Jour. Pharmacol. and Exp. Ther.*, v. 12, pp. 71–117, 1918.)

J. F. C.

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J. F. C.

ATOPHAN AND SEVERAL OF ITS DERIVATIVES.—Atophan is toxic to cold-blooded but not to warm-blooded animals; it paralyzes the central nervous system and the nerves of the heart in frogs. After administration to men the uric acid excretion was much increased, the atophan being excreted as hydroxyphenylquinolinecarboxylic acid which will, itself, increase uric acid excretion. (L. Rotter, *Z. exp. Path. Ther.*, 19, 176, 1918; *C. A.*, 12, 2384, 1918.)

J. F. C.

MEDICAL AND PHARMACEUTICAL NOTES.

STANNOXYL IN STAPHYLOCOCCAL INFECTIONS.—In *The Prescriber*, June, p. 111, reference was made to the experience of A. Compton in the use of stannoxyl (a mixture of tin and tin oxide) as a remedy for the mixed infection of pulmonary tuberculosis. The dose was there given as one Gm. daily. In a later communication (*Lancet*, 1918, 2, 234, Aug. 24) the same author reports on the use of this substance in three cases of broncho-pneumonia. The dose given was four one-Gm. tablets the first day, six the second, and eight per day afterwards. The pulse and temperature dropped; night sweats diminished; the sputum became less, and the weight gradually increased. (*The Prescriber*, October, 1918.)

DICHLORAMINE-T: POINTS IN USE.—Walter E. Lee (*Annals of Surgery*, 1918, 67, 14, Jan.) calls attention to certain points to be observed in handling dichloramine-T or its solutions. All bottles should be of dark amber, glass-stoppered. They should be thoroughly cleaned and dried before any of the materials are put in. If alcohol is used for drying the bottles, it should be allowed to evaporate completely before the bottles are used; no solutions should be returned to the stock bottles from the ward bottles or atomizers at any time; bottles in which the solution has already undergone decomposition should be carefully cleaned with hot water, and dried thoroughly. If, in using the 20 per cent. solution, medicine droppers or glass rods are used to transfer the oil to the wound surfaces, the droppers should be dry if put into the oil bottles. The common practice in some places has been to boil these utensils to sterilize, and then use them while still wet. This results in the gradual accumulation of water in the stock bottles, and a very rapid decomposition of the dichloramine-T. The glass rods or pipettes or syringes if left in contact with the oil for five or ten minutes are entirely sterilized, and do not need boiling. The method the authors have followed is to pour the required amount for the wound into a clean dry medicine glass, and to take the oil with the pipette from the second container. (*The Prescriber*, October, 1918.)

TRINITROTOLUENE POISONING.—A. W. Gregorson and F. E. Taylor place on record five cases of "TNT" poisoning, two of which were fatal. Gastric disturbances and peripheral neuritis were the earliest symptoms, headache, anæmia, and jaundice following in the order named. The intensity of the jaundice varied from week to week, and it was noticed that as the color faded the patients showed signs of improvement. The treatment recommended is as follows: Absolute rest in bed and warmth are essential. *Diet*—Milk, with 5 grains sod. bicarb. to the ounce; 6 ounces to be given two hours. Tea or coffee, *ad lib.* Benger's food, milk pudding, virol, imperial drink, barley water, albumin water, fish, rabbit, vegetables, but all excess must be carefully avoided, and fatty and saccharine foods prohibited. There must be a free exhibition of alkaline beverages to counteract the tendency to acid intoxication. *Medicines*—Calomel, 2 grains, followed by saline eight hours later; and the bowels regulated with cascara sagrada and sodium sulphate. To correct intestinal acidity it is

best to prescribe an insoluble alkaline carbonate such as magnesia. A mixture containing potassium citrate, sodium bicarbonate, and sodium sulphate should be given every four hours. Later, the patient may be given a mixture containing potass. bicarb., tinct. zingib., tinct. rhei co., and infus. gent. Rectal salines, with sod. bicarb. 2 ounces to the pint, may be given every six hours. Intravenous or subcutaneous saline injection, when the patient is first seen, gives great relief, and inhalation of oxygen through warm ether is a valuable stimulant. (*Glasgow Med. Jour.*, 1918, 2, 65; Aug. *The Prescriber*, October, 1918.)

COPPER SULPHOCARBOLATE.—The salts of copper have never been held in much favor as medicinal agents, particularly for internal use. Recently, however, a wave of enthusiasm has spread regarding copper preparations, and numerous investigators have reported on the use of copper compounds in cancer and in tuberculosis. In these cases the preparation recommended has been either a colloidal form of the metal or some special organic compound. Several reports have come from different quarters regarding one of the salts of copper—the sulphocarbolate. As these reports appear to be reasonable and well vouched for, a brief description of its properties and uses may be of interest.

Copper sulphocarbolate, $Cu(C_6H_4OH \cdot SO_3)_2$, occurs in greenish crystals, and is fairly soluble in water. The dose ranges from $\frac{1}{128}$ to $\frac{1}{24}$ grain. Like other inorganic salts of the same metal, large doses act as emetic, but in the doses mentioned no irritant action need be feared. Its action is that of an antiseptic, and it is particularly indicated in various forms of diarrhœa, especially when this is of a choleraic character. In an article in *The Prescriber* (1913, p. 176) its action as an intestinal antiseptic was fully described. The dose recommended is $\frac{1}{24}$ grain every hour: one grain in three ounces of water, a teaspoonful every hour. G. L. Servoss speaks highly of its uses in cases of food fermentation in children. In the preparation of food for bottle-fed babies he advises the addition to the water of a minute dose of copper sulphocarbolate. In addition to its antifermentative action, it admits of the water being used unboiled, and therefore containing all the original lime salts, an important consideration in the case of children. In the digestive disturbances common to children teething its action is also very

useful. A reference to its use in choleraic diarrhœa in India appeared in *The Prescriber,* June, p. 111.

The suggestion has also been made that it may be used in typhoid fever, but few authentic cases have been recorded of its employment in this disease. From the fact that a minute trace of copper has been found to kill the *Bacillus typhosus* in an hour, it would appear reasonable to try the salt. (*The Prescriber,* August, 1918.)

THERAPEUTIC ACTION OF "BENZOL."—The frequent references in current medical literature to the use of "benzol" in leukæmia make it desirable to have definite information as to the actual substance that is referred to. Benzol (B. P., 1898) is not suitable for medicinal use, and the substance referred to in this connection is what is more correctly known as *Benzene,* or crystallizable benzol, now official as *benzenum* (B. P., 1914), C_6H_6. This is a hydrocarbon obtained by the fractional distillation of coal tar, and is a colorless, mobile liquid, sp. gr. 0.880 to 0.887. When cooled to 0° C. it solidifies. The benzol of the 1898 Pharmacopœia is a mixture of hydrocarbons, and is suitable only for cleaning purposes or as a solvent.

The action of medicinal benzene is described in the list of new and non-official remedies published by the American Medical Association, from which the following extract is taken:

"When swallowed, this drug usually produces a sensation of burning in the stomach. Benzene is a narcotic which, when swallowed or inhaled, produces vertigo, delirium, and tonic convulsions, followed by deep sleep; 30 Cc. (one ounce) of nearly pure benzene has proved fatal. In some cases the chronic poisoning petechial spots, due to small hemorrhages, have been observed. These spots have been attributed to fatty degeneration of the blood vessels. It produces leucocytosis followed by leucopenia, with an occasional increased number of erythrocytes. Larger doses may produce an aplastic anæmia. Benzene has been used occasionally on account of its narcotic properties, and has also been used as an intestinal antiseptic. It is, however, rarely used for these purposes at the present time. It has been somewhat extensively used in the treatment of leukæmia. Moderate doses cause a rapid destruction of leucocytes, especially the lymphocytes. This action is accompanied by an improvement in the subjective symptoms, and, in some cases, by a marked reduction in the size of the spleen. In many cases

the lymphocytes have been reduced to the normal figure. In others the number of leucocytes has still remained high, although the size of the spleen was reduced. In many cases the improvement is such that an apparent cure is produced. However, a large number, if not all, of these patients relapse or succumb to the toxic action of the benzene. It is recommended to stop the administration of this drug before the leucocytes are reduced to the normal level. Benzene has also been used in a few cases of Hodgkin's disease and in cases of polycythemia. The effect of benzene on the leucocytes is largely enhanced by the previous or simultaneous treatment by the x-ray. The value of benzene in leukæmia is not established, and caution against too large and too long continued dosage should govern its employment.

"*Dosage.*—0.5 to 1 Cc. (8 to 15 minims) given four times a day. Medicinal benzene may be given in capsules or in an emulsion, or may be administered by rectum. Frequent examinations of the blood should be made during the administration of medicinal benzene to determine when it is advisable to suspend the administration of the medicine." (*The Prescriber,* August, 1918.)

"X. Y. Z." PASTE.—Under this name the following paste is recommended by A. E. Morison (*B. M. J.,* 1918, 1, 343, Mar. 23) as an alternative to "BIPP" in the treatment of certain classes of wounds:

Xeroform (bismuth tribromphenol).
Ammoniated mercury .....Equal parts
Liquid paraffin .....Sufficient to make paste.

(*The Prescriber,* August, 1918.)

MAGNESIUM SULPHATE SOLUTION.—The following is the solution recommended by Morison and Tulloch for wound treatment:

Magnesium sulphate ..... 40 ounces.
Glycerin ..... 10 ounces.
Water, boiling .....to make 80 fluid ounces.

MAGNESIUM SULPHATE CREAM.—

Magnesium sulphate ..... 1½ lbs.
Glycerin of carbolic acid (1:10) ..... 11 ounces.

Mix by trituration in a warm mortar. This cream is very hygroscopic, and must be preserved in covered jars.—Morison (*B. M. J.,* 1918, 1, 342, Mar. 23). (*The Prescriber,* August, 1918.)

EUSOL.—J. L. Smith (*B. M. J.*, 1917, 2, 386, Sept. 22) gives the following simple method for the preparation of eusol:

Liq. calcis chlorinat., B.P.	135 Cc.
Boric acid solution (4 per cent.)	250 Cc.
Water	to 1,000 Cc.

Dilute the chlorinated lime solution with water to 750 Cc., and add the boric acid solution. Should the solution be required for intravenous injection, dissolve 8.5 gm. of sodium chloride in 250 Cc. of water, and use this in diluting the chlorinated lime solution. (*The Prescriber,* August, 1918.)

METALLIC TIN AND STANNIC OXIDE AS A REMEDY FOR BOILS.—It has been noticed that among the tin workers in Beauce furunculosis is unknown, and metallic tin, or tin oxide, is regarded by them as a certain cure for boils. The authors have proved that both the metal and its oxide have decided bactericidal action. They found also that when administered to dogs for twenty consecutive days in daily doses of 2 Gms. no ill effects were evident, although the metal was absorbed, and could be detected in the urine for sometime after administration had ceased. They then proceeded to treat fifty cases of furunculosis with doses of 50 Cgms. to 1 Gm. of powdered tin, or its oxide. The results obtained have been excellent. The boils disappeared in five to fourteen days, and there were no relapses. (Frquin and Grégoire *Comptes rend.*, 164, 794, through *The Pharm. Jour. & Pharm.*, August, 1918.)

CURING WARTS BY SOLAR RAYS.—The following simple method is claimed to radically cure warts. The suns rays are directed by means of a lens into a focus of small diameter on the wart. If the heat is greater than can be borne, the height of the lens is altered and the irradiated spot widened. In either case, in bright sunshine, 30 seconds exposure is sufficient for each wart. In four or five days after this treatment the superficial portions of the wart will be browned and mortified. These are removed carefully with a sharp knife or razor, and the fresh surface is again exposed to the sun bath under the lens. Generally this second treatment will be sufficient, and the wart will shrivel up and fall off after a few days. If it does not the treatment may be repeated. (Dr. Vallet *Presse Méd.: Repertoire de Pharm.*, 1917, 28, 244, through *The Pharm. Jour. and Pharm.*, August, 1918.)

Iodide of Starch as an Antiseptic for Wounds.—Iodide of starch is recommended as an antiseptic for dressing wounds. It is very active as a bactericide, is stable, is not immediately destroyed by contact with the tissues, and may be left in contact with the wound for many hours, or even for several days, if necessary. Ordinary iodide of starch containing 18 to 20 per cent. of iodine is too irritant for this purpose. A combination of 1 part of iodine with 99 parts of starch is sufficiently active and is free from any irritant action. This is applied direct to the surface in powder form, or as a gelatinous paste by warming it with water. Usually wounds are found to be free from organisms after the third dressing with this. If it is desired to use Carrel's irrigation method, the following solution may be used. Soluble starch 25 Gms.; solution of iodine and potassium iodide, 1: 100, 50 mils; boiling water to make 1,000 mils. This contains 0.5 Gm. of iodine in 1 liter, and has an antiseptic power similar to that of Dakin's solution. It is non-irritant, and the adjoining surfaces need not be protected from its action. It has no destructive action on textile fabric, which the hypochlorites rapidly attack. (A. Lumière, *Comptes rend.*, 1917, 165, 376, through *The Pharm. Jour. and Pharm.*, August, 1918.)

Atophan and Several of Its Derivatives.—Atophan is toxic to cold-blooded but not to warm-blooded animals; it paralyzes the central nervous system and the nerves of the heart in frogs. After administration to men the uric acid excretion was much increased, the atophan being excreted as hydroxyphenylquinolinecarboxylic acid which will, itself, increase uric acid excretion. (L. Rotter, *Z. exp. Path. Ther.*, 19, 176, 1918; *C. A.*, 12, 2384, 1918.)

J. F. C.

The Effect of Various Agents on Superficial Hemorrhage and the Efficiency of Local Hemostatics.—Beginning with the most efficient, the order of efficiency of the more important of all the hemostatic agents tested is epinephrin, pituitary extract, tyramin, acetic acid, ferric chloride, quinine-urea-hydrochloride, tannin, sodium bicarbonate, barium chloride, cane sugar, sodium chloride. A number of other agents, which were tried, can lessen local hemorrhage in variable degrees, but on the whole they are inferior and undesirable for various reasons. The following among the more important of this class and for which hemostatic claims have been

made, were found to increase bleeding on local application; cotarnine salts (stypticin and styptol), antipyrin, peptone, emetine, sometimes alum, orthoform (1 per cent. solution) also quite markedly increased local bleeding. Under the conditions kephalin, coagulen, and thromboplastin were all variable, or did not affect the course of bleeding. (P. J. Hanzlik, *Jour. Pharmacol. and Exp. Ther.*, v. 12, pp. 71–117, 1918.)

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J. F. C.

BOOK REVIEWS.

ANNALS OF THE MISSOURI BOTANICAL GARDEN, No. 3, Vol. v, September, 1918.

Three articles of general botanic interest appear in this number of the *Annals*. The first of these is by E. A. Burt, mycologist to the Missouri Botanical Garden, and is entitled "The Thelephoraceae of North America." The author discusses the structure and distribution of fourteen species belonging to the genus *Aleurodiscus* that occur in North America. Accompanying the description of each species are valuable sketches of diagnostic portions of the fructifications. A key to the identification of the species is also given.

The second article is on "A New Selaginella from Mexico," by J. M. Greenman and Norma E. Pfeiffer. This species was collected with other plants in southern Mexico by Dr. W. J. G. Land and Prof.

Chas. R. Barnes in 1908, and has been named *Selaginella Landii* by the authors, after one of the collectors. Its characteristics are set forth both in Latin and English and by two splendid plates which portray both its habit and morphological peculiarities.

In the third article, entitled "A Wood-penetrating Alga, *Gomontia Lignicola,* nov. sp.," George T. Moore records his observations on a new species of *Gomontia* which he found growing within the tissues of yellow-pine wood, submerged in a fresh-water pond on Nashawena, Elizabeth Islands, Massachusetts. The author has carefully worked out the entire life history of the species which is here for the first time described and clearly illustrated by 19 figures on 3 plates.

HEBER W. YOUNGKEN.

AMERICAN METHODS IN FOREIGN TRADE, by George C. Vedder, First Edition. Published by McGraw-Hill Book Co., Inc., New York, N. Y., 204 pp.

This work is an admirable statement of the general principles that should obtain in the prosecution of American export trade. Not only is it a keen analysis of trade conditions, but its many valuable suggestions are evidently those of a practical man with a wide and fruitful experience.

Mr. Vedder states: "American manufacturers are not the best exporters in the world, but the best exporters in the world are American manufacturers. Volume of sales is not an all important consideration for it takes care of itself in due time if the methods are sound and constructive and possess continuity. Our weakness in the foreign trade field is not that we do not know how to export, but rather that, as yet, good American exporters are relatively few in number. The reality of the existence of distinctively American methods of building up a foreign trade may come as a surprise to many of our manufacturers, into whose ears has for two decades been pouring a crescendo stream of adverse criticism of their handling of export business. Our successful exporters have not imitated the English, French and German traders, but have studied their markets for themselves and solved the problems by the application of good business principles as they knew them. They have followed the Golden Rule in their dealings with buyers in overseas markets."

One of the most striking chapters is that on "The Fundamental Weakness of the German Trade Policy," which says in part:

"German business principles and methods were as much the offspring of autocracy as were the governmental policies of that country. Just as the naval and military establishments of the Kaiser disregarded all laws of civilization and humanity in the prosecution of their war aims, so German industry, supervised and directed, not by independent individuals whose survival depended on their fitness to serve society, but by imperial authority whose favor or disfavor decided to a large extent the average citizen's future, broke most of the basic laws, of good business and fair competition as we understand them."

Contrast the German standard with that of the American manufacturer, with his fine idealism, as thus portrayed by Vedder:

"The ideal exporting manufacturer is one who regards himself, not as a divinely appointed purveyor to the needs of other less able men, but as the privileged director of facilities of production that are necessary to society's welfare. He things not so much as his rights as his blessings, not so much of his talents themselves as of what they can do for the world, humbly acknowledging that the qualities of mind that make him a leader are largely unearned blessings and not a reason for deserved self-congratulations."

It is not possible to here detail the many interesting features of this work, such as nationalization of foreign trade, combination in foreign trade, export commission house, selling agent, manager, and manufacturer, exportation of raw, staple and standardized products, publicity, salesmanship, credit, correspondence, banks, investments, treaties, international crooks, tariffs, the "Made in Germany" idea, German competition, etc., but every phase of these questions is fully and most ably discussed.

To the American manufacturer who wishes to do export trade this book is indispensable.

J. W. ENGLAND.

REPORT OF THE PUBLIC HEALTH SERVICE.

The Annual Report of the Surgeon-General of the Public Health Service of the United States for the fiscal year ending June 30, 1918, has just appeared. This is the forty-seventh annual report covering the one hundred and twentieth year of the Service's existence.

By order of President Wilson, July 1, 1918, declaring that "All

sanitary or public health activities carried on by any executive bureau agency or office, especially created for or concerned in the prosecution of the war, shall be exercised under the supervision and control of the Secretary of the Treasury," all civil public health activities carried on by any Federal department, sanitary work in connection with ship-yards, supervision of all medical and sanitary matters in industrial plants having contracts with Ordnance Department, codes for protection for health workers in war industries, were placed under the Public Health Service.

The report is a comprehensive volume of 373 pages, embracing eight sections together with recommendations of the Surgeon-General and a financial statement with statistical report.

The Scientific Research Division has been exceedingly active, as shown in the report by investigation of epidemics, causation and control in different parts of the country. The division of Pharmacology has demonstrated a new and perhaps ideal standard for the biological assay of the active principle, derived from the posterior lobe of the pituitary gland. The new standard, potassium chloride, has the great advantage of permanency and chemical uniformity and if adopted by manufacturers would undoubtedly lead to the marketing of pituitary preparations of constant physiological activity and therapeutic value.

An investigation of vaccine virus causing tetanus in a few cases, demonstrated the possibility of ivory points being contaminated with tetanus spores. A recommendation for an order prohibiting the use of points for dispensing vaccine virus was the result. Also a standardized technique for testing vaccine virus for anaërobic contaminations has been worked out.

Rules and standards for the manufacture and sale of "Arsphenamine," heretofore known under the trade names of "Salvarsan," "606," "Arsenobenzol" and "Arsaminol," were prescribed by the service and promulgated by the Federal Trade Commission. This work alone is to be highly commended, as it permits the American product being used extensively and replacing the former foreign products.

Domestic Interstate Quarantine embraces the second part and deals especially with various water supplies used in interstate commerce, and results of vaccination against small-pox, typhoid and para-typhoid fever. The creation, on July 9, in the Public Health Service, of a Division of Venereal Diseases for controlling these dis-

eases, is discussed at some length. Noteworthy to pharmacists is the recommendation of "Prohibition of drug store prescribing for venereal diseases."

Extra-cantonment sanitation for the protection of the military forces is discussed quite extensively in about sixty pages, embracing the proper supervision over water, foods, milk supply, proper disposal of human excreta, elimination of breeding places of flies and mosquitoes, together with efficient control of communicable diseases.

Maritime quarantine of such great import for the prevention of the introduction of the various quarantinable diseases occupies considerable data. The grand total of passengers and crew inspected was 1,129,262, and of vessels fumigated, 3,954. For the destruction of rats and mosquitoes on vessels at the mainland stations, 1,108 ships were fumigated with cyanide gas and 1,101 vessels with sulphur dioxide.

Under Sanitary Reports and Statistics, the usual current publications are mentioned together with their wide range of information and their distribution. It is noteworthy that since the ending of the fiscal year, June 30, 1918, up to and including November 9, approximately 129,000 deaths from influenza and pneumonia (all forms) had been reported to the service.

The Personnel states that the close of the fiscal year presented forty-nine pharmacists on duty as follows: First-class, 31; second-class, 15, and third-class, 3. The miscellaneous division mentions the many publications, reprints, distribution and general matters of information distributed through the public-health bulletins.

Concluding with Needs of the Service, the Surgeon-General states that hospital accommodations should be supplied for the treatment of discharged soldiers and seamen. Up to the ending of the fiscal year, there had already been 14,000 patients discharged from the army for tuberculosis alone, and no provision had been made by the army for their care.

Additional funds are asked for to provide for the printing of the highly important and valuable publications of the department.

An appendix embracing the financial statement and a summary of physical examination together with a list of operations performed, ends the report.

This report is very comprehensive, embracing as it does a very wide field of investigation, dealing with every problem of public health and cannot but impress us with the activities of the Public

Health Service in the efforts to guard not only the health of our Army and Navy during the fiscal year, but the entire population of the country. The Public Health Service deserves great commendation for its invaluable guidance in the control of the health of the country.

MITCHELL BERNSTEIN, M.D.

DECEASE OF MRS. E. G. EBERLE.

As we are preparing for publication, the information is received of the demise of Mrs. Eugene G. Eberle, wife of Prof. E. G. Eberle, former president of the American Pharmaceutical Association and now the editor of the *Journal of the American Pharmaceutical Association,* on Sunday afternoon, February 8. Mrs. Eberle frequently accompanied the professor in his attendance at phamaceutical association meetings. She enjoyed the friendship of the ladies of the pharmaceutical circles and universally endeared herself to them by her kindness and loving and happy disposition. In the death of his dear wife our friend has lost his companion for life and his closest adviser and helpmate. Words fail to express the deep sense of our sorrow and sympathy. Many are the friends who highly esteemed her worth and who will mourn with him as they appreciate his great loss and theirs of a kind and good friend.